
Cesarean Delivery as a Marker for Obstetric Quality

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Abstract: Cesarean delivery is a frequent, easily obtainable, and meaningful event in obstetrics that has frequently been used as a quality indicator. However, its utility as a widespread marker of quality has several limitations. The cesarean delivery rate does not account for variation in levels of maternal care with varying maternal and fetal conditions. Attempts to risk adjust with the nulliparous, singleton, term, vertex cesarean, or the vaginal birth after cesarean rates fall short as, in obstetrics, it is the outcome of 2 patients, the mother and the infant, that ultimately matters. Newer and more sophisticated measures are increasingly available and offer greater potential to improve care for mothers and babies. However, much work is needed to create better quality metrics for obstetric care that can be measured and validated to truly reflect the quality of care women are receiving.

Key words: cesarean, quality of care, obstetrics

Overview

Even before the widespread use of quality indicators, cesarean delivery represented a quality assessment in obstetrics and

many organizations set target cesarean delivery rates.^{1,2} The rationale for incorporating cesarean delivery into early obstetric quality metrics is trifold. (1) The mode of delivery is a clear and discrete event, which can be easily ascertained, even from administrative data, which are often inexpensive to collect; (2) cesarean delivery is frequent enough to be able to compare rates across many types of institutions; (3) it is a meaningful event in that has been associated with adverse maternal outcomes in the current and future pregnancies.^{3–6}

Yet, despite its long history and ease of use, the rate of cesarean delivery is no longer recommended as a good quality measure. It has fallen out of favor for several reasons. It is not directly correlated with maternal and fetal outcomes, and is greatly affected by patient population and location and, thus, requires multiple and often complex risk adjustments. The most important concern is the difficulty in comparing cesarean delivery rates across institutions.

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Levels of Maternal Care

In the United States, there are different levels of hospitals, and they are set up and equipped to deal with different levels of patient complexity. For example, level I trauma centers and level III Neonatal Intensive Care Units admit higher acuity patients than most smaller community medical centers. Thus, the patient mix at any given hospital is not randomly distributed, resulting in some hospitals having far more high-risk patients than other hospitals. This is especially true in obstetrics where many states have created discrete perinatal regions and levels of care.⁷ Within these regions the “High Risk” referral centers may admit more patients with conditions requiring a cesarean delivery, such as placenta previa, severe preeclampsia, and fetal anomalies. As these conditions are not found equally in all hospitals, comparing cesarean rates between institutions with different patient populations without taking into account the differences in the patient population is inherently biased and unfair.

For some hospitals, a 20% cesarean rate would be far too high, whereas for other hospitals it would be far too low based on their patient risk profiles. Therefore, to be able to appropriately compare cesarean delivery rates between institutions, the differences in patient mix between hospitals must be accommodated by some form of risk adjustment.

The Nulliparous Singleton Term Vertex Cesarean

There have been many techniques of risk adjustment tried and tested.⁸ Although they are all “accurate,” many methods of risk adjustment are difficult to perform and opaque to the obstetric audience. The method of risk adjustment that has found the most favor is the nulliparous term singleton vertex cesarean rate (NTSV rate).⁹ The NTSV rate works by limiting

the population to include mostly lower risk women without an obvious indication for cesarean delivery. A lower rate in this population is purportedly better because of the association of cesarean delivery with adverse maternal outcomes in both the index and future pregnancies. Although not perfect, if cesarean rates are used to assess quality, the NTSV is probably the best measure. However, using cesarean rates in any way to assess quality still has pitfalls.

Cesarean delivery, even in the more narrowly defined NTSV cohort, is not necessarily an end unto itself. Although it is an intervention, not unlike induction of labor or an operative vaginal delivery, it may or may not lead to actual maternal morbidity or mortality. In the field of quality measurement, a cesarean delivery is referred to as a process measure. Process measures generally have the advantage of being on a 0% to 100% scale, and the direction of the scale (high or low being better) is generally understood. Typically, process measures are well accepted and evidenced-based actions, for example, the administration of antibiotics for pneumonia.¹⁰ These process measures do not require patient risk adjustments, allowing for more straightforward comparisons between institutions. Yet, as described above, cesarean deliveries do need risk-adjustment, thus losing one of the advantages of a typical process measure. Furthermore, lower rates for cesarean deliveries are not always “better” making the interpretation of the cesarean rate tricky.

Vaginal Delivery After Cesarean

Vaginal delivery or birth after cesarean (VBAC) delivery rates are also problematic. Once a woman has had a cesarean delivery, there is a small but real chance, 0.5% on average, that her scar could separate during labor called a uterine rupture.

Women with a prior cesarean are given the choice of having a repeat cesarean or trying to have a VBAC. This patient choice alone means that the VBAC rate is not a true reflection of the hospital system but may be a reflection of the patient population served and the choices they make. Thus, to judge hospitals on their patients' choices also seems problematic.

Because of the risk of uterine rupture, there are guidelines surrounding the hospital conditions that are needed to safely provide VBACs. These conditions include staff that is capable and available to provide emergency care.¹¹ For some hospitals, especially smaller hospitals, meeting these conditions might be quite difficult. In this situation a hospital VBAC rate of 0% might be a marker of GOOD quality of care because hospitals are not putting women at risk in a situation where it cannot be safely handled. In this situation, the convention that a high VBAC rate is good is turned upside down, again making the rate hard to interpret.

The True Outcome of Interest

The outcome of interest for most quality indicators is the ultimate well-being of patient. Although patients who undergo a cesarean are at increased risk for problems such as bleeding, infection, damage to other organs and thromboembolism, many cesareans are indicated to prevent other outcomes such as neonatal injury or maternal pelvic floor injury; thus, the tradeoff between these risks needs to be considered. If we knew in a given population exactly what the expected proportion of truly indicated cesareans should be, then the percentage above that threshold would represent the unindicated cesareans, which might better represent increased morbidity risk to patients. In obstetrics, it is the outcome of 2 patients, the mother and the infant, that ultimately matters. The cesarean delivery rate alone may not directly reflect those outcomes.

A recent paper argued that the cesarean rate should never be higher than 10% as recommended by the World Health Organization.¹² Ye and colleagues compared maternal and neonatal mortality rates around the world in relation to the cesarean delivery rate. Although they acknowledge that this was an association and not causal, they argue that cesarean rates > 10% are not associated with improvements in maternal and neonatal mortality. However, in the developed world, mortality alone is not an adequate outcome metric. Many cesareans in the United States are indicated for the prevention of maternal or neonatal morbidity, which is more common than mortality. Expectations in the first world go far beyond the goal of having the mother and child live.

Finding the "Sweet Spot"

As any obstetrician can tell you, the timing and technique of a delivery matters as much or more than whether the delivery is vaginal or abdominal. In general, cesarean deliveries put mothers at risk with the hope that their babies may benefit. If the timing of the cesarean is suboptimal, both the baby and the mother can have adverse outcomes. Alternatively, if no cesarean is done, the mother may also have an adverse outcome as evidenced by obstructed labors in the third world. What we really need is a measure of cesarean delivery that hits the "sweet spot": a cesarean done for the right reasons at the right time with good technique.

Determining whether a cesarean delivery falls into such a "sweet spot," however, is challenging with many costly hurdles. Administrative data, although widely available, are plagued by its often inaccurate coding diagnoses that lack sensitivity and the inability to capture the clinical decision-making behind a surgery. Even clinical databases created with careful review of the medical record often fail to reflect the subtle nuances involved in

the care of a laboring patient. In the end, there is enough disagreement on the definitions of the indications for cesarean that it remains challenging, even with chart review, to ascertain exactly when or if the risks of an operative delivery were merited in many clinical situations.

Quality measures have become particularly important because reimbursements and insurance contracts are being increasingly tied to quality. Although the reasoning behind these trends is sound, it is of utmost importance that the quality measures being used are of high value and that they have been thoroughly vetted. Furthermore, working obstetricians and patients need to be able to understand the rates and the meaning of their direction. Neither the cesarean rate nor the VBAC rate passes that test as a quality measure.

Moving Beyond Cesarean Rates

There is hope, for while measuring a meaningful cesarean rate (right operation at the right time with good technique) is not currently an adequate quality measure, it is possible to measure the maternal and neonatal outcomes resulting from a cesarean. Similar to overall cesarean delivery rates, raw outcomes such as hemorrhage, infection, and neonatal outcomes are not ideal quality measures and do need to be risk adjusted. Yet, they can give a fuller and more complete picture of the quality of care at an institution.¹³ Importantly, the maternal and neonatal outcomes can be weighed separately. This is helpful because hospitals can be compared by who delivers the best maternal and neonatal outcomes rather than trade off one for the other with a single indicator.

The Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal-Fetal Medicine Units (MFMU) Network recently undertook An Observational Cohort Study to

Evaluate Measures of Quality of Obstetric Care (APEX) to help find and validate quality measures for obstetrics.¹³ In the paper by Bailit and colleagues, risk adjustment models are described in detail so that individual hospitals can use them. The use of 4 primary outcomes (hemorrhage, third-degree and fourth-degree perineal lacerations, postpartum infection, and term neonatal outcomes) will allow quality of care to be measured for all modes of delivery. Hospitals that use cesarean deliveries to their best effect can then be identified. Furthermore, the trade-offs between cesarean and vaginal deliveries can be examined.

Of note, however, caution should be used in interpreting outcomes because “intra-institutional risk-adjusted probabilities of different obstetric outcomes are poorly correlated with each other and thus performance based on a single outcome cannot be generalized to overall obstetrical performance.”¹³ Instead, hospitals can be compared on each risk-adjusted outcome separately.

The National Quality Forum (NQF) also has several quality measures listed for reproductive health (http://www.qualityforum.org/Projects/n-r/Perinatal_Care_Endorsement_Maintenance_2011/Perinatal_and_Reproductive_Healthcare_Endorsement_Maintenance_2011.aspx). Whereas no one quality measure is perfect, the NQF measures have a vigorous vetting mechanism and measures have to periodically be reapproved to remain on the list of approved measures. The NQF measures represent the best currently available instruments for comparing hospitals.

Improving Care

By measuring outcomes and risk-adjusting them, it is possible to then look back at the processes that go into care to determine what hospital and physician activities are associated with better outcomes. It is well known that there are many

influences on the cesarean rate.^{14–25} The patient herself is only one factor among many including the unit size, time of day, unit census, and other practices that affect patient outcomes. How aspects such as staffing patterns and delivery volume of a hospital can be arranged to maximize patient outcomes can be determined by first looking at the processes of care in hospitals with good outcomes and then trying to spread those practices to other hospitals.

Techniques to spread best practices are now in use in some quality collaborative around the country and show great potential to translate better outcomes at one hospital to other hospitals.^{25,26} These cooperatives include both state initiatives such as the Ohio Perinatal Quality Collaborative and the national campaign to reduce maternal morbidity (<http://www.safehealthforeverywoman.org>). The backbone of these quality improvement methods is audit and feedback.²⁷ Audit and feedback measures physicians' behavior and provide individual practices and hospitals with reports on their performance. Each hospital submits data to a central agency that prepares the reports and maintains anonymity. It allows provider to see how they are doing in relation to others, without revealing the identity of the other hospitals encouraging people to share data freely.

Summary

Cesarean delivery rates, although easy to measure, are not a good marker for quality of care. Newer and more sophisticated measures are increasingly available and offer greater potential to improve care for mothers and babies. However, much work is needed to create better quality metrics for obstetric care that can be measured and validated to truly reflect the quality of care women are receiving.

References

1. National Center for Health Care Statistics. *Healthy People 2000 Review, 1994*. Hyattsville, Maryland: Public Health Service.
2. No author listed. Appropriate technology for birth. *The Lancet*. 1985;326:436–437.
3. Lydon-Rochelle M, Holt VL, Easterling TR, et al. Risk of uterine rupture during labor among women with a prior cesarean delivery. *NEJM*. 2001;345:3–8.
4. Petitti D. Maternal mortality and morbidity in cesarean section. *Clin Obstet Gynecol*. 1985;28:763–769.
5. Schuitemaker N, vanRoosmalen J, Dekker G, et al. Maternal mortality after cesarean section in the Netherlands. *Acta Obstetricia et Gynecologica Scandinavica*. 1997;74:332–334.
6. ACOG. Committee opinion no. 529: placenta accreta. *Obstet Gynecol*. 2012;120:207–211.
7. American Academy of Pediatrics, American College of Obstetricians and Gynecologists. *Guidelines for Perinatal Care: Seventh Edition*. Elk Grove Village, IL: American Academy of Pediatrics, American College of Obstetricians and Gynecologists; 2012.
8. Bailit J, Garrett J. Comparison of risk-adjustment methodologies. *Obstet Gynecol*. 2003;102:45–51.
9. Main EK, Bloomfield L, Hunt G. For the Sutter H, First P, Delivery Clinical Initiative CDevelopment of a large-scale obstetric quality-improvement program that focused on the nulliparous patient at term. *Am J Obstet Gynecol*. 2004;190:1747–1756.
10. National Quality Forum. Emergency medicine: Community-Acquired Bacterial Pneumonia (CAP): Empiric Antibiotic. Available at: <http://www.qualityforum.org>. Accessed June 18, 2014.
11. ACOG. Practice Bulletin No. 115: vaginal birth after previous cesarean delivery. *Obstet Gynecol*. 2010;116:450–463.
12. Ye J, Betrán AP, Vela MG, et al. Searching for the optimal rate of medically necessary cesarean delivery. *Birth*. 2014;41:237–244.
13. Bailit JL, Grobman WA, Rice MM, et al. Risk-adjusted models for adverse obstetric outcomes and variation in risk-adjusted outcomes across hospitals. *Am J Obstet Gynecol*. 2013;209:446.e1–46.e30.
14. Berkowitz GS, Fiarman GS, Mojica MA, et al. Effect of physician characteristics on the cesarean birth rate. *Am J Obstet Gynecol*. 1989;161:146–149.
15. Burns L, Geller S, Wholey D. The effect of physician factors on the cesarean section decision. *Med Care*. 1995;33:365–382.
16. Carpenter MW, Soule D, Yates WT, et al. Practice environment is associated with obstetric decision making regarding abnormal labor. *Obstet Gynecol*. 1987;70:657–662.

17. Curtin SC, Park MM. Trends in the attendant, place, and timing of births, and in the use of obstetric interventions: United States, 1989-97. *Natl Vital Stat Rep.* 1999;47:1-12.
18. Fraser W, Usher RH, McLean FH, et al. Temporal variation in rates of cesarean section for dystocia: does "convenience" play a role?. *Am J Obstet Gynecol.* 1987;156:300-304.
19. Heffner L, Elkin E, Fretts R. Impact of labor induction, gestational age, and maternal age on cesarean delivery rates. *Obstet Gynecol.* 2003;102:287-293.
20. Klasko S, Cummings R, Balducci J, et al. The impact of mandated in-hospital coverage on primary cesarean delivery rates in a large non-university teaching hospital. *Am J Obstet Gynecol.* 1995;172:637-642.
21. Le Ray C, Carayol M, Zeitlin J, et al. Group PS Level of perinatal care of the maternity unit and rate of cesarean in low-risk nulliparas. *Obstet Gynecol.* 2006;107:1269-1277.
22. Luthy DA, Malmgren JA, Zingheim RW, et al. Physician contribution to a cesarean delivery risk model. *Am J Obstet Gynecol.* 2003;188:1579-1585.
23. Rosen M. Practice environment is associated with obstetric decision making regarding abnormal labor [Editorial comment]. *Obstet Gynecol.* 1987;70:661-662.
24. Tussing AD, Wojtowycz MA. The effect of physician characteristics on clinical behavior: cesarean section in New York State. *Social Sci Med.* 1993;37:1251-1260.
25. The Ohio Perinatal Quality Collaborative Writing Committee. A statewide initiative to reduce inappropriate scheduled births at 36 0/7 to 38 6/7 weeks' gestation. *Am J Obstet Gynecol.* 2010;202:243.e1-43.e8.
26. Clark SL, Frye DR, Meyers JA, et al. Reduction in elective delivery at < 39 weeks of gestation: comparative effectiveness of 3 approaches to change and the impact on neonatal intensive care admission and stillbirth. *Am J Obstet Gynecol.* 2010;203:449 e1-6.
27. Jamtvedt G, Young JM, Kristoffersen DT, et al. Audit and feedback: Effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2004;2:2.