

Cesarean Delivery: Counseling Issues and Complication Management

JEFFREY D. QUINLAN, MD, *Uniformed Services University of the Health Sciences, Bethesda, Maryland*

NEIL J. MURPHY, MD, *Alaska Native Medical Center, Anchorage, Alaska, and University of Washington, Seattle, Washington*

Nearly one-third of all deliveries in the United States are cesarean deliveries. Compared with spontaneous vaginal delivery, cesarean delivery is associated with increased maternal and neonatal morbidity and mortality. Interventions that decrease the chance of a cesarean delivery include avoiding non-medically indicated induction of labor, avoiding amniotomy, and having a doula present. In North America, the most common reasons for cesarean delivery include elective repeat cesarean delivery, dystocia or failure to progress, malpresentation, and fetal heart rate tracings that suggest fetal distress. Post-cesarean delivery complications include pain, endomyometritis, wound separation/infection, urinary tract infection, gastrointestinal problems, deep venous thrombosis, and septic thrombophlebitis. Women with no risk factors for deep venous thrombosis other than the postpartum state and the operative delivery do not require thromboembolism prophylaxis other than early ambulation. A pregnant woman's decision to attempt a trial of labor after cesarean delivery or have a planned repeat cesarean delivery involves a balancing of maternal and neonatal risks, as well as personal preference after counseling by her physician. Approximately 75% of attempted trials of labor after cesarean delivery are successful. Provision of advanced maternity care practices by family physicians, including serving as primary surgeons for cesarean deliveries, is consistent with the goals of the patient-centered medical home. (*Am Fam Physician*. 2015;91(3):178-184. Copyright © 2015 American Academy of Family Physicians.)



More online
at <http://www.aafp.org/afp>.

CME This clinical content conforms to AAFP criteria for continuing medical education (CME). See CME Quiz Questions on page 160.

Author disclosure: No relevant financial affiliations.

The cesarean delivery rate in the United States increased from 4.5% in 1965 to 32.9% in 2009.^{1,2} The increase is a result of both the higher rate of primary cesarean deliveries and the decrease in rates of vaginal birth after cesarean delivery (VBAC). *Table 1* shows the range of cesarean delivery rates throughout the industrialized world.³

The maternal mortality rate for a primary cesarean delivery is eight per 100,000 births⁴ and 13.4 per 100,000 births for elective repeat cesarean delivery (ERCD).⁵ One-half of these deaths are related to intraoperative complications. The most common causes of maternal death include complications from preeclampsia when it is the indication for cesarean delivery, pulmonary thromboembolism, amniotic fluid embolism, and hemorrhage.⁶

Prevention

Most nulliparous women have a strong preference for vaginal delivery.⁷ Pregnant women should be encouraged to take childbirth classes to prepare for the labor and delivery experience. Interventions that

decrease the chance of a cesarean delivery include avoiding non-medically indicated induction of labor,⁸ avoiding amniotomy,⁹ and having an experienced doula present to provide continuous labor support and reassurance.¹⁰

Indications

Indications for cesarean delivery are listed in *Table 2*. The most common indications in North America are ERCD (30%), dystocia or failure to progress (30%), malpresentation (11%), and fetal heart rate tracings that suggest fetal distress (sinusoidal pattern or absent variability with recurrent late decelerations, recurrent variable decelerations, or bradycardia; 10%).¹¹

Postoperative Care

Postoperative care after cesarean delivery (*eTable A*) is similar to that for any major abdominal surgery. The dressing should be removed after 24 hours and the wound monitored daily. Surgical clips can be removed and tape strips placed after three days for transverse skin incisions and after five to seven days for vertical incisions.

SORT: KEY RECOMMENDATIONS FOR PRACTICE

<i>Clinical recommendation</i>	<i>Evidence rating</i>	<i>References</i>
Oral fluids should not be withheld after cesarean delivery.	A	12
Prophylactic antibiotics should be administered to all patients undergoing cesarean delivery.	A	15, 16
Women with no risk factors for deep venous thrombosis other than the postpartum state and the operative delivery should be mobilized early postoperatively.	B	20
For women with at least one additional risk factor for deep venous thrombosis, pharmacologic or mechanical prophylaxis (compression stockings or intermittent pneumatic compression device) should be used while the patient is in the hospital.	B	20
For women with multiple risk factors for deep venous thrombosis, pharmacologic prophylaxis should be combined with mechanical prophylaxis (intermittent pneumatic compression device).	B	20
Women at high risk of complications (e.g., those with a history of classical or T incision, uterine rupture, or extensive transfundal uterine surgery) and women in whom vaginal delivery is otherwise contraindicated (e.g., because of placenta previa) are not candidates for planned trial of labor after cesarean delivery.	C	25

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to <http://www.aafp.org/afpsort>.

Pain management is an important aspect in early postoperative care. Initial pain control may be obtained with narcotics provided preoperatively via intrathecal administration or postoperatively by patient-controlled anesthesia pumps. Patients should be transitioned to oral narcotics and nonsteroidal anti-inflammatory drugs once they are able to eat and drink. Incisional pain, which often worsens with activity, can be controlled with scheduled use of oral medications.

Although it has been customary for fluids or food to be withheld for a period of time after abdominal operations, this policy has no advantages over early feeding after uncomplicated cesarean delivery.¹² Fertility planning should be discussed before discharge and again at the six-week follow-up visit.

RETURN TO ACTIVITY

Recommendations for activity after cesarean delivery are based on tradition and anecdote. The available data do not support many of the recommendations currently provided.¹³ Patients should receive consistent pre- and postprocedure counseling, and an adequate postoperative analgesic regimen.

Lifting and climbing stairs increase intra-abdominal pressure much less than the Valsalva maneuver, forceful coughing, or rising from the supine position to an erect position.¹⁴ Patients may continue the same lifting and stair patterns as before surgery.¹³

There is no retrospective or prospective evidence regarding driving after cesarean delivery. Cognitive function and use of narcotic analgesics, rather than wound-related concerns, should determine if and when patients can drive. Women may resume driving when they are comfortable with the hand and foot movements required for driving.¹³

There is limited retrospective and prospective evidence regarding exercise after cesarean delivery. Forceful coughing increases intra-abdominal pressure as much as jumping jacks.¹⁴ Patients can resume preprocedure exercise levels when they feel comfortable doing so, although the programs should be tailored for postpartum women.¹⁵

There is no consistent retrospective evidence and no prospective evidence regarding vaginal intercourse after cesarean delivery. Women and their partners should make the decision to resume intercourse mutually, and should use vaginal lubricants and sexual positions that permit the woman to control the depth of vaginal penetration.¹³

There is no consistent prospective or retrospective evidence regarding return to work. Women should weigh personal comfort, bonding with their newborn, and familial considerations when making the decision. A graded return should be considered.¹³

Table 1. Cesarean Delivery Rates in Developed Countries

<i>Country</i>	<i>Rate (%)</i>	<i>Country</i>	<i>Rate (%)</i>
Brazil	45.9	China	25.9
Italy	38.2	Spain	25.9
Mexico	37.8	United Kingdom	22.0
Australia	30.3	Denmark	21.4
United States	30.3	France	18.8
Germany	27.8	Japan	17.4
Canada	26.3	Saudi Arabia	13.0
Ireland	26.2		

Information from reference 3.

Table 2. Common Indications for Cesarean Delivery

Abdominal cerclage
Active herpes outbreak
Congenital anomalies
Conjoined twins
Contracted pelvis (e.g., congenital or prior fracture)
Cord prolapse
Dystocia or failure to progress in labor (e.g., arrest of descent or dilation)
Elective repeat cesarean delivery
Fetal heart rate tracings that suggest fetal distress (sinusoidal pattern or absent variability with recurrent late decelerations, recurrent variable decelerations, or bradycardia)
Human immunodeficiency virus infection
Malpresentation (e.g., breech, brow, face/mentum posterior, transverse lie)
Medical conditions (e.g., cardiac, pulmonary, thrombocytopenia)
Obstructive pelvic tumor
Perimortem (mother in cardiac arrest)
Placenta previa
Placental abruption
Reconstructive vaginal surgery
Vasa previa

Early Postoperative Complications

Infection is the most common complication within the first 10 days after cesarean delivery. The rate of infection without prophylactic antibiotics approaches 85%, whereas the infection rate with prophylactic antibiotics is only about 5%.¹⁵ Prophylactic antibiotics should be administered to all patients undergoing cesarean delivery; a single dose of a first-generation cephalosporin or ampicillin is effective.^{15,16}

ENDOMYOMETRITIS

Endomyometritis is a clinical diagnosis that presents as uterine tenderness, fever (two postoperative temperatures higher than 100°F [38°C] more than 24 hours after delivery), and leukocytosis. Overall, 90% to 95% of cases will resolve within 72 hours with a combination of broad-spectrum intravenous antibiotics, such as clindamycin and an aminoglycoside, or with a third-generation cephalosporin alone.¹⁷ A small percentage of patients will develop further complications.

WOUND SEPARATION/INFECTION

Wound separation after cesarean delivery occurs in approximately 5% of cases. It may involve the skin through fascia. Nearly two-thirds of the wounds that open are infected.¹⁸

Wound infection presents as erythema and tenderness, and may develop purulence and cause fever. Wound infection is a clinical diagnosis with laboratory results serving as an adjunct. Treatment includes broad-spectrum antibiotics. The wound may need to be probed, opened, irrigated, and packed, and necrotic tissue debrided.

Fascial dehiscence is uncommon (0.3% of cesarean deliveries), but it occurs in approximately 6% of open wounds.¹⁸ It presents as copious discharge and may be followed by protrusion of the bowel. If this occurs, the bowel should be covered with moist sterile gauze pad, and surgical consultation should be obtained immediately.

URINARY TRACT INFECTION

Urinary tract infections are often associated with use of an indwelling catheter. Treatment should be initiated with broad-spectrum antibiotics and subsequent antibiotic therapy based on urine culture sensitivity results.

GASTROINTESTINAL COMPLICATIONS

An ileus presents as abdominal distention, nausea, vomiting, and failure to pass flatus. Bowel sounds may be absent. Radiographic studies show distended loops of small and large bowel, with gas usually present in the colon. Treatment involves withholding oral intake, awaiting the return of bowel function, and providing adequate fluids and electrolytes.

In contrast, obstruction presents as high-pitched bowel sounds and peristaltic rushes. Radiographic studies show single or multiple loops of distended bowel, usually in the small bowel, with air-fluid levels. The patient may need nasogastric suctioning or a duodenal-jejunal tube. Surgical consultation is warranted if an obstruction persists despite conservative management.

THROMBOEMBOLIC COMPLICATIONS

Deep venous thrombosis (DVT) is three to five times more common after cesarean delivery than after vaginal delivery.¹⁹ DVT can progress to pulmonary embolus if untreated. It typically presents as unilateral leg tenderness, swelling, and a palpable cord.

The American College of Chest Physicians recommends early ambulation in women with no risk factors for DVT other than the postpartum state and the operative delivery.²⁰ For women with at least one additional risk factor, pharmacologic prophylaxis with low-molecular-weight heparin or mechanical prophylaxis (compression stockings or intermittent pneumatic compression device) while the patient is in the hospital is recommended.²⁰ For women with multiple risk factors, pharmacologic and mechanical prophylaxis should be initiated.²⁰ In patients

receiving pharmacologic prophylaxis before delivery, it should be discontinued at least 24 hours before scheduled cesarean delivery and resumed six to 12 hours after delivery.^{20,21} Table 3 outlines a risk stratification approach to thromboembolism prophylaxis.²²

SEPTIC THROMBOPHLEBITIS

Septic thrombophlebitis is a diagnosis of exclusion. Persistent and unexplained fever is often the only symptom, although some patients have pelvic pain. Findings on physical examination, ultrasonography, and computed tomography are often negative. Continued fever despite several days of antibiotic therapy suggests septic thrombophlebitis. Traditional treatment includes intravenous heparin in combination with antibiotics; however, evidence of benefit is lacking.²³

Trial of Labor After Cesarean Delivery

The decision by a pregnant woman to attempt a trial of labor after cesarean delivery (TOLAC) or a planned ERCD involves balancing individual maternal and neonatal risks, as well as personal preference after counseling by her physician. A thorough understanding of available evidence is essential in providing this counseling to patients.

The American Academy of Family Physicians (AAFP) recently published a clinical practice guideline that provides an evidence-based approach to counseling women about labor after a previous cesarean delivery.²⁴ The multidisciplinary panel recommends that patients deciding between TOLAC and ERCD receive an individualized assessment and subsequent counseling about the benefits and risks of each. The panel also concluded that a planned trial of labor is an option for most women with a previous cesarean delivery.

The full guideline can be accessed at <http://www.aafp.org/pvbac>. In addition, a summary appearing in the *Annals of Family Medicine* can be accessed at <http://www.annfam.org/content/13/1/80>.

Documentation of counseling and the management plan should be included in the medical record. During the informed consent process, at least three basic issues need to be addressed. These are the patient's plan for future family size, the chance of successful VBAC, and safety concerns.

Women at high risk of complications (e.g., those with a history of classical or T incision, uterine rupture, or extensive transfundal uterine surgery) and women in whom vaginal delivery is otherwise contraindicated (e.g., because of placenta previa) are not candidates for planned TOLAC.²⁵

Table 3. Risk Assessment for Thromboembolism in Patients Who Undergo Cesarean Delivery

Low risk: early ambulation

Cesarean delivery for uncomplicated pregnancy with no other risk factors

Moderate risk: low-molecular-weight heparin or compression stockings

Age > 35 yr
Obesity (BMI > 30)*
Parity > 3
Gross varicose veins
Current infection
Preeclampsia
Immobility for > 4 days before operation
Major current illness
Emergency cesarean delivery during labor

High risk: low-molecular-weight heparin and compression stockings

Presence of more than two risk factors from the moderate-risk section
Cesarean hysterectomy
Previous deep vein thrombosis or known thrombophilia

*—BMI denotes body mass index (the weight in kilograms divided by the square of the height in meters).

Reprinted with permission from Marik PE, Plante LA. Venous thromboembolic disease and pregnancy. *N Engl J Med.* 2008;359(19):2031.

PLANNED FAMILY SIZE

There is no difference in risk of peripartum hysterectomy between planned cesarean delivery and planned vaginal delivery. However, there is a significantly increased risk of placenta previa, placenta accreta, and placenta previa with accreta after a woman's first cesarean, and a significantly increased risk of the need for gravid hysterectomy after a woman's second cesarean delivery.²⁶ Additionally, death rates increase from eight in 100,000 deliveries with the first cesarean delivery to 39 in 100,000 with the fourth cesarean delivery.⁴

CHANCE FOR SUCCESS

Approximately 75% of attempted TOLACs will be successful, although this rate varies depending on the clinical situation that led to the first cesarean delivery.⁵ The likelihood of VBAC is highest in women with a previous vaginal delivery, a body mass index of 25 kg per m² or less, previous cesarean delivery for breech presentation, spontaneous onset of labor with ripe cervix, and age younger than 35 years (Table 4).⁷

SAFETY

The benefits of VBAC is decreased maternal risk associated with vaginal delivery (e.g., decreased blood loss and lower risk of transfusion, decreased risk of DVT,

Table 4. Factors That Impact the Success of a Trial of Labor After Cesarean Section

Decreased success (< 60%)*

- Two or more prior cesarean sections without a vaginal delivery
- Cesarean section for failure to descend in second stage
- Labor induction required
- Infant 4,000 g or more
- Body mass index greater than 40 kg/m²
- Maternal age older than 35 years

Neutral success (65%-75%)

- Gestational age older than 40 weeks
- Prior cesarean delivery for nonreassuring fetal monitoring
- Unknown scar
- Twins (limited data)
- Labor augmentation
- Two prior cesarean sections with history of vaginal birth (limited data)
- Cesarean section for failure to progress in first stage of labor
- Body mass index 25-40 kg/m²

Increased success (>75%)

- Prior successful vaginal birth
- BMI 25 kg/m² or less
- Prior cesarean delivery for breech presentation
- Spontaneous labor with ripe cervix by Bishop score
- Maternal age younger than 35 years

*—Percentages are estimates of the influence of a single factor's influence on the success of a trial of labor. Because patients rarely present with only one of these issues, providers must try to balance the impact of a series of influences to individually guide patients in their decision to attempt trial of labor as the delivery plan. Note that even in the presence of factors that have a negative impact, most women attempting a trial of labor after cesarean delivery will be successful.

Reprinted with permission from Leeman LM. Prenatal counseling regarding cesarean delivery. *Obstet Gynecol Clin North Am.* 2008; 35(3):484.

decreased risk of infection) and a quicker recovery period, with decreased length of hospitalization.

Planned ERCD and planned VBAC are both associated with benefits and harms. Evidence for the risks and benefits of TOLAC vs. ERCD are predominantly from retrospective cohort studies.²⁷ The rate of perinatal mortality associated with TOLAC is similar to that in infants born to nulliparous women in labor (1.3 per 1,000 births with TOLAC compared with 0.5 per 1,000 births with ERCD).²⁸

UTERINE DEHISCENCE OR RUPTURE

Uterine dehiscence, asymptomatic scar separation that does not penetrate the serosa or produce hemorrhage, occurs in 12.6 per 1,000 TOLACs. This rate is comparable to that in women undergoing ERCD.²⁸ Uterine rupture is a through-and-through scar separation that

is clinically symptomatic and requires surgical intervention. The overall rate of uterine rupture during TOLAC is 0.7%.^{29,30} eTable B lists the factors that influence the risk of uterine rupture during TOLAC.

Fetal bradycardia is the most common and characteristic clinical manifestation of uterine rupture.³¹ Variable or late decelerations may precede the bradycardia, but there is no fetal heart rate pattern that is pathognomonic of rupture.

Maternal manifestations, including vaginal bleeding, are variable. In women with known uterine scarring or trauma, uterine rupture should be suspected with constant abdominal pain and signs of intra-abdominal hemorrhage. Other clinical manifestations include signs of shock, cessation of uterine contractions, loss of station of the fetal presenting part, uterine tenderness, and change in uterine shape.

Treatment of uterine rupture is largely dependent on the patient's hemodynamic status and desire for future fertility. In some cases, a layered closure of the myometrium is sufficient, although hysterectomy may be necessary.

FACILITY LIMITATIONS

The American College of Obstetricians and Gynecologists (ACOG) recommends that TOLAC be undertaken at facilities capable of emergency surgical deliveries.²⁵ The Northern New England Perinatal Quality Improvement Network VBAC guidelines use a three-tiered, risk-based system that can be modified for capabilities of individual facilities and availability of resources, and as new data emerge (Table 5).³²

The AAFP's guideline development panel specifically reviewed available data related to resources required at a hospital to offer TOLAC. They found that the limited data available demonstrate similar outcomes for women with TOLAC irrespective of hospital delivery volume, location, or type. The panel recommended that all women be counseled about the capabilities of the facility in which they plan to deliver, and that high risk women be referred to a hospital able to provide emergent care as required.²⁴

Family Physicians as Primary Surgeons

The joint AAFP and ACOG recommended curriculum guidelines for family medicine residents describe core and advanced obstetric training for family physicians.³³ Throughout the United States, more than 2,000 family physicians perform cesarean deliveries as the primary surgeon.³⁴ Family physicians are the only surgeons in some rural areas, and provision of advanced maternity care practices by family physicians is consistent with the goals of the patient-centered medical home.

Table 5. Risk-Based Guidelines for Vaginal Birth After Cesarean Delivery

<i>Patient classification</i>	<i>Condition/complications</i>	<i>Management approach*</i>
Low risk	One prior low transverse cesarean delivery Spontaneous onset of labor No need for augmentation No repetitive fetal heart rate abnormalities Patients with a prior successful vaginal birth after cesarean delivery are especially low risk (however, their risk status escalates the same as other low-risk patients)	No additional interventions Physician performing cesarean delivery is permitted to have other acute patient care responsibilities
Medium risk	Induction of labor Oxytocin (Pitocin) augmentation Three or more prior low transverse cesarean deliveries Less than 18 months between prior cesarean delivery and current delivery	Physician performing the cesarean delivery is present in the hospital during the active phase of labor but permitted to have other acute patient care responsibilities An open and staffed operating room is available, or there is a plan in place if immediate delivery is required; this may be having a room where there is adequate lighting and instruments, and general anesthesia can be administered if needed An anesthesia physician is present in the hospital during the active phase of labor Anesthesia staff are permitted to have other acute patient care responsibilities There is an established back-up protocol for anesthesia services during busy times
High risk	Repetitive nonreassuring fetal heart rate abnormalities not responsive to clinical intervention Bleeding suggestive of abruption Two hours without cervical change in the active phase despite adequate labor	The physician performing the cesarean delivery is present in the hospital and does not have other acute patient care responsibilities Anesthesia staff is present in the hospital and do not have other acute patient care responsibilities An open and staffed operating room is available

*—For each patient classification, all of the interventions listed for that classification apply.
Information from reference 32.

There are more than 30 fellowships for family physicians wanting training to perform cesarean deliveries as the primary surgeon. Published studies indicate that family physicians performing cesarean deliveries meet or exceed national standards.³⁵ The AAFP’s position paper on cesarean delivery in family medicine can

be accessed at <http://www.aafp.org/about/policies/all/cesarean-delivery.html>.

Data Sources: In addition to a literature search completed in 2011 for the American Academy of Family Physicians’ Advanced Life Support in Obstetrics Chapter Q: Cesarean Delivery published in March 2012, we searched the Cochrane Database of Systematic Reviews, the National Guideline Clearinghouse, and PubMed using the key words cesarean delivery, vaginal birth after cesarean, trial of labor after cesarean delivery, family physician, and family medicine residency, individually and in combination. Search dates: January 27, 2012, and July 25, 2014.

This article is one in a series on “Advanced Life Support in Obstetrics (ALSO),” coordinated by Larry Leeman, MD, MPH, ALSO Managing Editor, Albuquerque, N.M.

The Authors

JEFFREY D. QUINLAN, MD, is vice chair in the Department of Family Medicine at the Uniformed Services University of the Health Sciences in Bethesda, Md.

NEIL J. MURPHY, MD, is a staff member in the Obstetrics and Gynecology Department at Alaska Native Medical

BEST PRACTICES IN MATERNAL CARE: RECOMMENDATIONS FROM THE CHOOSING WISELY CAMPAIGN

<i>Recommendation</i>	<i>Sponsoring organization</i>
Do not schedule non–medically indicated (elective) inductions of labor or cesarean deliveries before 39 weeks, 0 days’ gestation.	American Academy of Family Physicians and American College of Obstetricians and Gynecologists

SOURCE: For more information on the Choosing Wisely Campaign, see <http://www.choosingwisely.org>. For supporting citations and to search Choosing Wisely recommendations relevant to primary care, see <http://www.aafp.org/afp/recommendations/search.htm>.

Cesarean Delivery

Center in Anchorage, and an associate professor in the Department of Family Medicine at the University of Washington in Seattle.

Address correspondence to Jeffrey D. Quinlan, MD, Uniformed Services University of the Health Sciences, 4301 Jones Bridge Rd., Rm. A-1033C, Bethesda, MD 20814-4712 (e-mail: jeffrey.quinlan@usuhs.edu). Reprints are not available from the authors.

REFERENCES

1. Centers for Disease Control and Prevention. Births: final data for 2010. *Natl Vital Stat Rep.* 2012;61(1):1-71. http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_01.pdf. Accessed October 20, 2012.
2. Menacker F, Hamilton BE. Recent trends in cesarean delivery in the United States. *NCHS Data Brief.* 2010;(35):1-8.
3. Gibbons L, Belizán JM, Lauer JA, Betrán AP, Meriáldi M, Althabe F. The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year: overuse as a barrier to universal coverage. Geneva, Switzerland; World Health Organization; 2010. <http://www.who.int/healthsystems/topics/financing/healthreport/30C-sectioncosts.pdf>. Accessed June 27, 2014.
4. Miller ES, Hahn K, Grobman WA; Society for Maternal-Fetal Medicine Health Policy Committee. Consequences of a primary elective cesarean delivery across the reproductive life. *Obstet Gynecol.* 2013;121(4):789-797.
5. National Institutes of Health. NIH Consensus Development Conference on Vaginal Birth After Cesarean: new insights. Final panel statement, March 8-10, 2010. <http://consensus.nih.gov/2010/vbacstatement.htm>. Accessed June 27, 2014.
6. Clark SL, Belfort MA, Dildy GA, Herbst MA, Meyers MA, Hankins GD. Maternal death in the 21st century: causes, prevention, and relationship to cesarean delivery. *Am J Obstet Gynecol.* 2008;199(1):36.e1-5.
7. Leeman LM. Prenatal counseling regarding cesarean delivery. *Obstet Gynecol Clin North Am.* 2008;35(3):473-495, ix.
8. Ehrenthal DB, Jiang X, Strobino DM. Labor induction and the risk of a cesarean delivery among nulliparous women at term. *Obstet Gynecol.* 2010;116(1):35-42.
9. Smyth RMD, Alldred SK, Markham C. Amniotomy for shortening spontaneous labour. *Cochrane Database Syst Rev.* 2013;(1):CD006167.
10. McGrath SK, Kennell JH. A randomized controlled trial of continuous labor support for middle-class couples: effect on cesarean delivery rates. *Birth.* 2008;35(2):92-97.
11. Penn Z, Ghaem-Maghani S. Indications for caesarean section. *Best Pract Res Clin Obstet Gynaecol.* 2001;15(1):1-15.
12. Mangesi L, Hofmeyr GJ. Early compared with delayed oral fluids and food after caesarean section. *Cochrane Database Syst Rev.* 2002;3(3):CD003516.
13. Minig L, Trimble EL, Sarsotti C, Sebastiani MM, Spong CY. Building the evidence base for postoperative and postpartum advice. *Obstet Gynecol.* 2009;114(4):892-900.
14. Wall E, Roberts R, Deutchman M, Hueston W, Atwood LA, Ireland B; Trial of Labor After Cesarean (TOLAC) Policy Team. Trial of labor after cesarean (TOLAC), formerly trial of labor versus elective repeat cesarean section for the woman with a previous cesarean section. American Academy of Family Physicians policy action. March 2005. http://www.annfamned.org/content/suppl/2005/07/26/3.4.378.DC1/TOLAC_2005_Guideline.pdf. Accessed June 27, 2014.
15. Smaill FM, Gyte GM. Antibiotic prophylaxis versus no prophylaxis for preventing infection after cesarean section. *Cochrane Database Syst Rev.* 2010;(1):CD007482.
16. Hopkins L, Smaill FM. Antibiotic prophylaxis regimens and drugs for cesarean section. *Cochrane Database Syst Rev.* 2000;(2):CD001136.
17. Duff P. Antibiotic selection in obstetrics: making cost-effective choices. *Clin Obstet Gynecol.* 2002;45(1):59-72.
18. Martens MG, Kolrud BL, Faro S, Maccato M, Hammill H. Development of wound infection or separation after cesarean delivery. Prospective evaluation of 2,431 cases. *J Reprod Med.* 1995;40(3):171-175.
19. Zotz RB, Gerhardt A, Scharf RE. Prediction, prevention, and treatment of venous thromboembolic disease in pregnancy. *Semin Thromb Hemost.* 2003;29(2):143-154.
20. Bates SM, Greer IA, Middledorp S, Veenstra DL, Prabulos AM, Vandvik PO. VTE, thrombophilia, antithrombotic therapy, and pregnancy: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest.* 2012;141(2 suppl):e691S-e736S.
21. James A; Committee on Practice Bulletins—Obstetrics. Practice bulletin no. 123: thromboembolism in pregnancy. *Obstet Gynecol.* 2011;118(3):718-729.
22. Marik PE, Plante LA. Venous thromboembolic disease and pregnancy. *N Engl J Med.* 2008;359(19):2025-2033.
23. Falagas ME, Vardakas KZ, Athanasiou S. Intravenous heparin in combination with antibiotics for the treatment of deep vein septic thrombophlebitis: a systematic review. *Eur J Pharmacol.* 2007;557(2-3):93-98.
24. American Academy of Family Physicians. Clinical practice guideline: planning for labor and vaginal birth after cesarean. January 2015. <http://www.aafp.org/pvbac>. Accessed January 12, 2015.
25. American College of Obstetricians and Gynecologists. ACOG practice bulletin no. 115: vaginal birth after previous cesarean delivery. *Obstet Gynecol.* 2010;116(2 pt 1):450-463.
26. Silver RM, Landon MB, Rouse DJ, et al.; National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Maternal morbidity associated with multiple repeat cesarean deliveries. *Obstet Gynecol.* 2006;107(6):1226-1232.
27. Dodd JM, Crowther CA, Huertas E, Guise JM, Horey D. Planned elective repeat cesarean section versus planned vaginal birth for women with a previous caesarean birth. *Cochrane Database Syst Rev.* 2013;(12):CD004224.
28. Vaginal birth after cesarean (VBAC). AHRQ Publication no. 03-E018. Rockville, Md.: Agency for Healthcare Research and Quality; March 2003.
29. Spong CY, Landon MB, Gilbert S, et al.; National Institute of Child Health and Human Development (NICHD) Maternal-Fetal Medicine Units (MFMU) Network. Risk of uterine rupture and adverse perinatal outcome at term after cesarean delivery. *Obstet Gynecol.* 2007;110(4):801-807.
30. Landon MB, Hauth JC, Leveno KJ, et al.; National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. *N Engl J Med.* 2004;351(25):2581-2589.
31. Ridgeway JJ, Weyrich DL, Benedetti TJ. Fetal heart rate changes associated with uterine rupture. *Obstet Gynecol.* 2004;103(3):506-512.
32. Northern New England Perinatal Quality Improvement Network VBAC Guidelines. December 2011. http://www.nnepqin.org/documentUpload/NNEPQIN_VBAC_Guideline_revised_2011.docx. Accessed July 11, 2014.
33. Maternity and gynecologic care. Recommended core educational guidelines for family practice residents. http://www.aafp.org/dam/AAFP/documents/medical_education_residency/program_directors/Reprint261_Maternity.pdf. Accessed July 31, 2014.
34. Deutchman M, Connor P, Gobbo R, FitzSimmons R. Outcomes of cesarean sections performed by family physicians and the training they received: a 15-year retrospective study. *J Am Board Fam Pract.* 1995;8(2):81-90.
35. Heider A, Neely B, Bell L. Cesarean delivery results in a family medicine residency using a specific training model. *Fam Med.* 2006;38(2):103-109.

eTable A. Typical Guidelines for Postoperative Care After Cesarean Delivery

Assess vital signs and fundal status every hour for four hours, every four hours for 24 hours, then every eight hours; massage the uterus per the same schedule and report extra lochia

Assess intake and output every four hours for 24 hours

Activity can occur ad libitum; encourage ambulation three times per day

The patient should cough and breathe deeply every hour when awake

Foley catheter to closed drainage; discontinue catheter the first postoperative morning or when the patient is ambulating well

Regular diet can resume as tolerated after nausea resolves

Administer dextrose 5% and lactated Ringer solution with 20 units of oxytocin (Pitocin), 1 L given at 125 mL per hour for two bags, then dextrose 5% and lactated Ringer solution at 125 mL per hour

Convert to heparin lock when the patient is tolerating oral intake well

Administer intravenous pain medication, such as morphine 2 to 8 mg intravenously every two hours as needed

Administer anti-nausea/antiemetic therapy, such as promethazine 25 to 50 mg intramuscularly every four hours as needed

Administer oral pain medication, such as oxycodone/acetaminophen (Percocet) one to two tablets every three to four hours as needed, after tolerating oral intake

Laboratory tests: first postoperative morning, measure hemoglobin and hematocrit levels

Administer Rh₀(D) immune globulin (Rhogam) if indicated by infant cord blood Rh status

Administer rubella, hepatitis, and Tdap (tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis) vaccines at discharge if indicated

eTable B. Factors Influencing Risk for Uterine Rupture

Decreased (< 1%)*

- Prior vaginal delivery
- Low uterine segment incision from prior cesarean
- Preterm delivery
- Two-layer closure of uterine incision

Neutral (1%-2%)

- Induction of labor with good Bishop score with oxytocin
- One-layer uterine closure
- Gestational age of more than 40 weeks
- Low vertical uterine incision (limited data; could be increased to up to 5%)
- Unknown uterine scar without high risk for prior classical incision

Increased (> 2%-4%)

- Unknown scar in the setting of high risk for prior classical incision (e.g., preterm abnormal lie or term transverse lie)
- Classical or T uterine incision (4%-9%)
- Lower uterine segment thickness less than 1.5 mm on ultrasound at term
- Prior myomectomy, cornual resection, or other full-thickness uterine surgery
- Prior uterine rupture
- Morbid obesity (body mass index ≥ 40 kg/m²)
- Two or more prior uterine incisions without vaginal delivery
- Induction of labor with poor Bishop score with prostaglandin agent or oxytocin

**—Percentages are estimates of the influence of a single factor's influence on the likelihood of uterine rupture. Because patients rarely present with only one of these factors and evidence is limited on the additivity of multiple factors, physicians or midwives must try to assess the impact of a series of influences to provide individualized guidance to a patient during prenatal care.*

Reprinted with permission from Leeman LM. Prenatal counseling regarding cesarean delivery. Obstet Gynecol Clin North Am. 2008; 35(3):486.