Minimizing Obstetrical Risk
A manual for obstetricians and family physicians practicing OB

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MMIC Risk Management Department
Partners in Patient Safety
promoting safety – minimizing risk
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Introduction

It is a paradox of medicine that the greater the improvement, the greater the potential for error. Advances in technology and clinical practice increase the chance that something vital will be overlooked. The combination of increased expectations and increased potential for error can be disastrous for obstetrical practitioners. Throughout the country, pregnancy and birth-related claims top the list in indemnity expense. It is not surprising that malpractice losses have driven many physicians from the practice of obstetrics. The personal toll on practitioners involved in a malpractice suit, along with the financial risks, makes this field among the riskiest in medicine today.

While some untoward outcomes cannot be prevented even with exemplary care under the best of circumstances, a significant number of malpractice cases are indefensible, the result of poor judgment and systems problems. The majority of claims relate to:

♦ Physician-caused injury
♦ Weak documentation of complex deliveries
♦ Poor physician rapport with the patient
♦ Incomplete test reporting and follow-up

That’s the bad news.

The good news is that the above liability areas respond effectively to the simple tools of risk management. You can take steps today to improve your clinical skills, documentation, and rapport, and to close any gaps in your test reporting and follow-up systems.

Minimizing Obstetrical Risk is a preventive guide to situations that have caused physicians the most trouble. It includes tools and suggestions for reducing bad outcomes and malpractice claims.

The Obstetrical Task Force

As a local company owned and directed by its members, Physicians Insurance is dedicated to its mission of improving the quality of medical care and reducing adverse outcomes.

In response to the alarming number of obstetrical claims, the Risk Management Department convened a task force to identify and address issues that affect fetal outcome. Members of the task force represent a variety of practice disciplines, settings, and locations throughout Washington State. Individual members in turn consult with colleagues in their specialty organizations to present the most current approaches to optimal management of obstetrical patients.

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Clinical Members, Obstetrical Task Force

Robert Jeffers, MD—Chair
Obstetrics and Gynecology, Edmonds

Donald Barford, MD
Perinatology, Everett

Edith Cheng, MD
Obstetrics and Gynecology
University of Washington, Seattle

Jan Delli-Bovi, MD
Obstetrics and Gynecology
Mount Vernon

Thomas Easterling, MD
Obstetrics and Gynecology
University of Washington, Seattle
About This Book

The recommendations in this guidebook are not intended to establish a standard of care, nor are they a substitute for legal advice. The fact that a physician’s practice varies from these guidelines does not itself establish that the physician failed to meet the required standard of care. Compliance with these guidelines, however, may reduce the risk of facing a lawsuit and the stress that accompanies even a successful defense in court. The guiding principle should be your best clinical judgment and a medical record that clearly reflects that judgment at each decision point.

We encourage you to add your own practice aids to this book, and to keep it in a place where you and your staff can refer to it often. The Dystocia Flash Cards and the HELPER flyer are intended to be placed in a prominent location. Keep the flash cards in a lounge where they can be reviewed over a cup of coffee. Copy the flyer for posting on the back of a door or on a tabletop. The more familiar you are with high-risk procedures, the more likely you will recall them in an emergency.

Finally, if you know or learn of a practice tool that would benefit your colleagues in one of the areas addressed by this guidebook, let us hear from you! Minimizing Obstetrical Risk is intended as a living reference that will draw from the collective experience of the obstetrical community.
Introduction

Because shoulder dystocia can ambush even the most experienced practitioners, a well-conceived plan of action is essential to help prevent complications that could lead to brain damage, Erb’s palsy, or death. The text that follows outlines strategies and guidelines in the event of a brachial plexus injury. Also included are:

- **HELPER for Shoulder Dystocia Flyer**
  
  We recommend that you copy and share the enclosed 8 1/2” x 11” flyer with your colleagues and nurses on the Labor and Delivery unit. Place one in every delivery room; affix one on the side of a monitor, inside a cabinet, or on a tabletop.

  An 11” x 17” version of the flyer is available for physician and nurse lounges and restrooms (both good places for repetitive study). Please contact Physicians Insurance for copies.

  Remember, even with a bad outcome such as a permanent brachial plexus injury, you will most likely have a defensible case if you can show that you went through the correct steps to manage it.

- **Shoulder Dystocia Flash Cards**
  
  In the heat of the moment, you are more likely to recall the recommended steps for dealing with a shoulder dystocia if you have periodically reviewed the flash cards during breaks in your schedule.

  Since this problem may present unexpectedly, it is wise to give yourself the benefit of ongoing review of the management techniques. Occasionally reviewing and practicing ALL of the steps, perhaps in conjunction with an easily resolved shoulder dystocia, or even during a routine delivery, should enable the practitioner to maintain a high level of readiness.

- **Shoulder Dystocia Dictation Guide/Chart Form Sample**
  
  The most important step to take following a shoulder dystocia is to adequately and accurately document what occurred, including which shoulder was impacted. Careful documentation frequently will dissuade even the most aggressive plaintiff’s attorney from pursuing legal action.

  To ensure that your records are comprehensive, we’ve included a format for covering significant information in the event of a shoulder dystocia. Follow this guide in completing your dictated note or writing out your documentation. It may also be incorporated into the hospital chart.

- **Forceps/Vacuum Dictation Guide/Preoperative Note**
  
  Use this form as a dictating guide, a guide for your written note, or a record for the chart.

Prevention

Shoulder dystocia does occur unexpectedly. The risk of incurring a permanent injury can be diminished by appropriate labor management and skilled maneuvers at the time of dystocia. However, the most prudent care and most careful delivery will not prevent all brachial plexus injuries. Even the best of practitioners may perform a delivery associated with permanent injury. A comprehensive program of risk reduction should help the practitioner reduce the risk of dystocia and injury for each delivery and simultaneously build a defensible case when an injury is experienced.

Risk Factors

Three clinical factors are associated with the risk of shoulder dystocia:

1. Macrosomia
2. Abnormal Labor
3. Operative Vaginal Delivery
Macrosomia

The practitioner should routinely estimate fetal weight and record the estimated fetal weight for all women in labor. Diabetes and postdate pregnancies are at particular risk for macrosomia. Documentation of clinical estimation of fetal weight is useful. While you may occasionally include ultrasound to help estimate fetal weight, this method is not necessarily any more accurate than the clinical estimate.

Labor associated with an estimated fetal weight ≥4000 g should be considered at risk for shoulder dystocia. The risk for permanent injury of a diabetic fetus ≥4000 g or nondiabetic fetus ≥4500 g may approach 1%. In these cases, discuss the option of primary cesarean section with the patient, and document the discussion. In nondiabetic fetuses ≥4000 g but <4500 g, the risk of shoulder dystocia increases but the risk of permanent injury is less than 1%.

The first step in managing the risks of shoulder dystocia and permanent injury is to estimate fetal weight in all labors and document that estimation.

Abnormal Labor

Deviations from normal labor patterns and/or the presence of estimated fetal weight ≥4000 g should alert the clinician to the possibility of dystocia and permanent injury. The use of Friedman’s Labor Curve will help the practitioner prospectively identify the abnormal labor.

When macrosomia is suspected, an abnormal labor should heighten the practitioner’s awareness of potential shoulder dystocia.

Operative Vaginal Delivery

Delivery by forceps or vacuum from +2 (ACOG criteria 0–+5) or higher station increases the risk of shoulder dystocia. When macrosomia and an abnormal labor are associated with such deliveries, the risk of permanent injury approaches 1%. Use particular care in assessing station. The practitioner should be certain that the skull, rather than just the caput, is at an adequate station.

Avoid the combination of macrosomia, abnormal labor, and operative vaginal delivery when possible. Except in emergent clinical circumstances, the practitioner has discretion over addition of the third risk, operative vaginal delivery.

Patient Involvement

As in all clinical situations, patients should be partners in decision making. When risks are identified, inform patients of options and the nature and magnitude of the risks, as in the following example:

“Ms. Jones, I suspect you may be carrying a larger-than-average baby. Sometimes with larger babies, delivery of the shoulders after the head is delivered can be difficult and, in rare circumstances, can result in permanent injury. If your labor is abnormal or if you are unable to push your baby out without my help, we may need to perform a cesarean section or try some other techniques to help deliver the baby.”

Whenever we are faced with difficult decisions, patients should be informed of the options. When risks are relatively balanced between two alternatives, a patient’s willingness to accept one type of risk rather than another is an important consideration in the final choice of action. The court case Villanueva v. Harrington, 906 P.2d 374, 376 (Wash. 1995), established that under the law of informed consent, patients must be told of the risks and alternatives of an operative delivery. Documentation of discussions with patients is essential.
Example:

The risks of shoulder dystocia with a large baby were discussed with Ms. Jones and her partner. They would like to proceed with labor as long as the course of labor remains normal. Procedures, alternatives, benefits, and risks of operative delivery discussed with patient. Patient agrees to operative delivery as necessary.

or

The risks of shoulder dystocia associated with a large baby were discussed with Ms. Jones and her partner. Her sister had a baby with a permanent brachial plexus injury. Ms. Jones would rather accept the risks of cesarean section than a risk to her baby.

Reference


The Obstetrical Task Force and Physicians Insurance wish to acknowledge the contribution of Thomas J. Benedetti, M.D., to this chapter.
A Guideline for Physicians

The impulse to deny the problem and avoid the family can be strong after a less than optimal outcome. Here are some guidelines for contact with the involved family after a brachial plexus injury.

In The Hospital

1. Sit on the bed or in a chair close to the bed when you are talking with the new mother and her family.
2. Maintain eye contact with the mother and family members.
3. Review the sequence of events at delivery: what was done, why it was done.
4. Provide facts:
   ◆ Of every 1,000 babies born, 15 to 60 deliveries may be complicated by a shoulder dystocia.
   ◆ Although shoulder dystocia is more commonly associated with large babies, it can occur with babies of normal to small size.
   ◆ 80% of babies with a brachial plexus injury have complete resolution of the problem within one year.
5. Allow the family to know your concern and that you will be there for them.
6. Ask if there is a time the mother wants you to return to explain details to other family members.
7. Contact your malpractice insurer for advice.

After Hospital Discharge

1. Call the family in one week and again in one month (more often is fine).
2. If you sense there is a family member or friend who is angry with you, ask permission from the patient to call that individual. Invite him or her to your office. Let the family know you are not afraid.
3. If the baby is transferred and it is possible for you, visit the NICU when the baby’s parents are going to be there.

Remember to keep in touch with patients whose babies have a brachial plexus injury. Letting them know you care can make a big difference.
Shoulder Dystocia Dictation Guide/Chart Form Sample

Date: ____________________  Time: ____________________

Attending Physician: ____________________  Assistant: ____________________

Pregnancy Complications:
- Diabetes (insulin) □
- Gestational Diabetes □
- Postdates □

Labor Complications:
- Protracted Active Phase □
- Secondary Arrest of First Stage □
- Prolonged Second Stage □

Delivery Mode:
- Spontaneous □
- Vacuum □
- Forceps □

OUTLET □
- Position (please circle): ROA OA LOA ROT LOT ROP OP LOP

Station: Scalp Visible □
- Skull at Pelvic Floor □

Present?: Labial Separation □
- Dilating Rectum □

Bulging Perineum □

LOW □
- Position (please circle): ROA OA LOA ROT LOT ROP OP LOP

Station ≥+2 (of 5) □

Shoulder Dystocia
- Anterior Shoulder R L □
- Episiotomy? 2nd 3rd 4th □

Time Head Delivered: ____________________

Time Delivery Completed: ____________________

Total Elapsed Time: ____________________

Maneuvers:
- McRoberts □
- Suprapubic Pressure □
- Shoulder Rotation □
- (Wood’s or Ruben’s) □
- Posterior Arm □
- Replacement of Head for C-section □

Neonate
- Weight: __________
- Apgars: _____1 min _____ 5 min _____ 10 min
- CORD: Venous pH _____ Arterial pH ______
- GASES: _______ pCO₂ _______ pCO₂ _______
- pO₂ _______ pO₂ _______
- HCO₃ _______ HCO₃ _______
- BE _______ BE _______

Moro Reflex:
- Symmetrical? Yes □ No □
- R L Impaired □

Required admission to special care nursery? Yes □ No □

Narrative:

__________________________

__________________________

__________________________

__________________________

__________________________

__________________________

__________________________

__________________________

Transfer? Yes □ No □

__________________________, M.D.
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### Forceps/Vacuum Dictation Guide/Operative Note

**Date:**

**Time:**

**Delivery Attendants:**

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**Indication**

- **Fetal Distress**
  - Specify ________________________________________________________________
- **Prolonged Second Stage**
  - Specify ________________________________________________________________
- **Maternal Disease**
  - Specify ________________________________________________________________

**Delivery Mode:**

- **Vacuum**
  - **Forceps**

**Outlet**

- **Position (please circle):**
  - ROA
  - OA
  - LOA
  - ROT
  - LOT
  - ROP
  - OP
  - LOP

**Station:**

- Scalp Visible
- Skull at Pelvic Floor
- Labial Separation
- Dilating Rectum
- Bulging Perineum

**Low**

- Position (please circle):
  - ROA
  - OA
  - LOA
  - ROT
  - LOT
  - ROP
  - OP
  - LOP

**Station ≥+2 (of 5)**

**Apgars:**

- 1 min
- 5 min
- 10 min

**Required admission to special care nursery?**

- Yes [ ]
- No [ ]

**Narrative:**

---

______________________________, M.D.
**HELPER** For Shoulder Dystocia

- Have RN push digital clock and call out time interval
- Avoid excessive force
- Document which shoulder was impacted

**Call for Help**

**Episiotomy**

**Suprapubic Pressure** (NOT fundal pressure)

**Legs Back** (McRoberts maneuver)

**Enter vagina for shoulder rotation**

**Reach for posterior arm** (and deliver the posterior shoulder)

Replace fetal head (Zavanelli maneuver). Rotate head to A-P position, flex, and replace in vagina. Proceed with emergent Cesarean Section

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Removing the Barriers to the Timely Performance of Cesarean Section

Our review of the company’s claims data revealed that the delayed performance of cesarean section is a recurrent theme. In some situations, it was obvious the delay contributed to an unfavorable outcome. In other cases, a causal relationship was questionable but the indefensibility of these cases was attributed to a deviation from The American College of Obstetrics and Gynecology’s established guidelines. Current guidelines require that a standard obstetric unit be able to initiate a cesarean section within 30 minutes from the time of decision to operate. It is well known, however, that catastrophic situations such as uterine rupture, hemorrhage from placenta previa, abruptio placentae, and prolapse of the umbilical cord require delivery in less than the 30-minute time frame. Physicians at facilities unable to implement a more expeditious cesarean section should advise patients of this limitation. A consent form, as well as documentation of the discussion, should be included in the chart. Barriers to the timely performance of cesarean section are:

◆ Unavailability of physician
◆ Poor nurse-physician communication
◆ Reluctance to seek consultation
◆ Lack of staff preparedness
◆ External pressure to decrease the incidence of cesarean section

The highly reliable labor and delivery unit has established policies and procedures that substantially reduce or eliminate these barriers.

Physician Availability

Institutional evidence suggests that continuous, on-site physician supervision of the laboring patient decreases the incidence of unfavorable events. A team approach, with shared responsibility for having a physician present during active labor, is possible even in smaller communities comprised of solo practices.

Nurse-Physician Communication

In the highly charged environment of the obstetric unit, good communication between nurses and physicians is vital. Face-to-face contact is preferable to telephone consultation when there is any concern about the labor or delivery. Because the stakes are so high, ANY question of maternal or fetal well-being should alert the physician on call to proceed to the hospital.

One effective vehicle for promoting a working-team approach is the physician-nurse liaison committee. We strongly recommend regular meetings of the two groups on all obstetric units. Meetings can provide a forum to air differences, resolve disputes, and discuss cases. They should involve all unit members or designated representatives from each group, including a neonatal nurse or pediatrician.

An alternative to the physician-nurse liaison committee is a morbidity and mortality conference in which physicians (including pediatricians/neonatologists) and nurses participate regularly in case discussions and examination of common issues.

Increasing Consultation

The higher the quality of collaboration among physicians on difficult cases, the more likely the right decisions will be made. Healthy working relationships between physicians can set a positive tone for the entire department. Yet professional jealousies
and interspecialty competition often impede a collaborative climate. The increasing focus on cost control creates an additional challenge to deliver optimal care. There is therefore a greater imperative for physicians to consciously resolve to communicate with one another.

**Staff Preparedness**

Does your obstetric unit carry out a policy of regular practice drills for the staff? In the highly reliable organization, personnel from labor and delivery, newborn nursery, and anesthesia services are familiar with the entire cesarean-section procedure. They keep the operating room in a constant state of readiness—with appropriate supplies, anesthesia equipment, and surgical instruments. Regular drills minimize confusion during emergencies, probably resulting in more favorable outcomes.

Obstetric services should anticipate the need for anesthesia services whenever the remotest possibility of a cesarean section arises. Develop a high index of suspicion, and establish clear protocols for the early notification of the on-call anesthesiologist.

**References**


Guidelines for candidate selection and management

The old adage “once a cesarean section, always a cesarean section” has gradually changed, with increasing experience and support for vaginal delivery after prior cesarean section. With rising cesarean-section rates in the late 1980s and repeat cesarean section comprising one-third of all cesarean deliveries, greater employment of vaginal birth after cesarean section (VBAC) was encouraged and helped to stabilize cesarean-section rates in the 1990s.

VBAC, when successful, is associated with many maternal benefits: shorter hospital stays, fewer transfusions, and a decreased incidence of postpartum fever. However, recent data suggest the maternal safety of elective cesarean section is roughly equivalent to that of vaginal birth. Unsuccessful trial of labor (TOL), followed by unscheduled cesarean section, is associated with greater risks of morbidity, infection, and major complications than elective repeat cesarean section. Infant infection rates are higher after an unsuccessful trial of labor.

Uterine rupture is the most serious risk associated with VBAC. Uterine-rupture risk may be as much as 10 times greater in a trial of labor than with elective repeat cesarean section. Though the published rate of uterine rupture is approximately 0.8%, this event may be catastrophic for mother and baby.

As the utilization of VBAC has become more widespread, catastrophic consequences have increased and, correspondingly, so have the number of malpractice claims. The keys to minimizing the risk are:

◆ Careful patient selection
◆ Well-documented informed consent
◆ Judicious labor management

Patient Selection

The American College of Obstetrics and Gynecology practice bulletin lists the following selection criteria for VBAC candidates:

♦ 1 or 2 prior low transverse cesarean sections for non-labor-related indications (HSV, breech presentation, etc.)
♦ Clinically adequate pelvis
♦ No prior rupture
♦ MD immediately available within the hospital or adjacent office building throughout labor and capable of performing cesarean delivery
♦ Anesthesia and OR personnel available

Women whose prior cesarean section indication was non-labor-related (abruption, previa, fetal distress, breech) have VBAC success rates of approximately 75%. Women who underwent prior cesarean section for labor-related reasons (CPD, dysfunctional labor, failed induction, birth weight >4 kg) have success rates at 50% or less.

Spontaneous onset of labor and prior vaginal birth are associated with higher likelihood of successful VBAC, as is prior vaginal birth. Labor induction, however, increases the risk of uterine rupture nearly two-fold.

Contraindications for VBAC

♦ Prior classical cesarean section—associated with uterine-rupture risk of up to 12%
♦ Prior T-shaped incision or other transfundal uterine surgery
♦ Contracted pelvis
♦ Medical or surgical complication that contraindicates vaginal delivery

AND

♦ Inability to perform emergency cesarean delivery because of unavailable surgeon, unavailable anesthesia, insufficient staff, or inadequate facility
Prior Uterine Incisions
Be sure to document prior uterine incisions. When documentation is unavailable, the patient’s history may offer some assistance in determining the prior uterine incision.

◆ Classical incisions are more likely when the indication for cesarean section is preterm breech presentation, transverse lie, multiple gestation, or placenta previa.
◆ Many Russian surgeons prefer the classical incision.
◆ Mexican surgeons commonly use the Kerr low transverse incision.

Informed Consent
The benefits, risks, and potential complications of VBAC should be thoroughly discussed, and the discussion carefully documented. When the patient and her physician have jointly established a management plan, the plan should be documented in the prenatal record. A sample informed-consent form is included at the end of this chapter.

Labor Management
Early induction to avoid complications of macrosomia is not associated with a higher probability of a successful vaginal delivery. Induction of labor should be reserved for women with established obstetrical indications. The patient with an unfavorable cervix is not a good candidate for induction. Spontaneous labor is strongly encouraged and is associated with a greater likelihood of a successful vaginal delivery.

Labor management in a woman undergoing a trial of labor after cesarean section should occur in a hospital setting—with the capabilities and resources to mount an emergent response if needed. Facilities that are unable to implement an emergency cesarean section in approximately 15 minutes should consider not performing VBAC in favor of repeat cesarean delivery. Type and screen on admission is prudent. It is also important to notify anesthesia and the operating room staff of a VBAC in progress. Continuous fetal heart rate monitoring is recommended.

Epidural anesthesia, once considered a contraindication in a trial of labor, has not been associated with uterine rupture or a lower success rate of vaginal delivery. The availability of epidural anesthesia may encourage some women to choose trial of labor as an alternative. Epidural anesthesia can be associated with a delay in recognition of a rupture.

Oxytocin, used judiciously, is not contraindicated in a trial of labor. Greater risk of uterine rupture has been shown in one study to be associated with high infusion rates of oxytocin. Dysfunctional labor is associated with an eight-fold increase in the incidence of uterine rupture! Use of oxytocin for augmentation of dysfunctional labor requires careful monitoring.

Factors Associated With Increased Risk of Uterine Rupture:
◆ Latent phase oxytocin use—2.7 RR
◆ Two or more prior cesarean sections—3.8 RR
◆ Dysfunctional labor—8.1 RR
◆ Misoprostol use in labor induction—5.0 RR
◆ Labor induction—1.7 RR
◆ Failure to progress in labor—2.7 RR

Signs of Uterine Rupture:
◆ Fetal heart rate abnormalities—bradycardia or variable decelerations
◆ Loss of fetal station
◆ Cessation of contractions
◆ Vaginal bleeding
◆ Hypotension
◆ Decreasing amplitude of contractions (IUPC)
Cost considerations have garnered greater attention in our efforts to more wisely allocate the health care dollar. The average total cost for a cesarean birth is currently about twice the cost of a normal vaginal birth. Hence, VBAC is a cost-effective alternative to repeat cesarean section when appropriate candidate selection is made.

The safety and efficacy of VBAC have been well documented and, for most women, the benefits of a successful VBAC far outweigh the risks. The physician, as the patient’s caregiver and advocate, has the best opportunity to counsel and encourage the appropriate patient to undergo a trial of labor.

References


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Risk Management Strategies For VBAC

**Key Points**

I. **Patient Selection**
   A. Eliminate all those with:
      1. Prior classical cesarean section
      2. Prior T-shaped incision or other transfundal uterine surgery
      3. Prior rupture
      4. Contracted pelvis
   B. Consider selecting out those with:
      1. Age >35
      2. No prior vaginal delivery
      3. Labor-related prior cesarean section
      4. Unfavorable cervix at term

II. **Documentation and Communication**
   A. Document prior uterine incision.
   B. Use a detailed informed-consent form.
   C. Document all discussions and interventions.
   D. Communicate the management plan with all caretakers: FPs, OBs, anesthesiologists, pediatricians, and nursing staff.

III. **Labor Management**
   A. Alert anesthesia and operating room staff that a VBAC is in progress and emergent operative intervention may be necessary.
   B. Allow spontaneous labor whenever possible.
   C. Use oxytocin judiciously and preferably with intrauterine catheter monitoring.
   D. Respond promptly to nursing staff concerns.
   E. Be alert for signs of uterine rupture, including:
      1. Non-reassuring fetal heart rate pattern with variable decelerations
      2. Late decelerations
      3. Bradycardia
      4. Undetectable fetal heart rate
      5. Decreasing amplitude of contractions
      6. Loss of fetal station
      7. Cessation of contractions
      8. Vaginal bleeding
      9. Hypotension
   F. Err on the side of caution—be prepared for cesarean delivery at first severe deep variable deceleration (60 beats below baseline for 60 seconds).
   G. If uterine rupture occurs, favorable outcome depends upon delivery within 10–15 minutes.
Patient name: _______________________________________ Date of birth: ______________________

I request and authorize Dr. ____________________________ or his/her associates or assistants to perform a vaginal birth after cesarean section (VBAC) upon me.

Because I have had at least one cesarean (C-section) delivery, I understand that there are specific considerations which may affect my decisions in this pregnancy.

VBAC (vaginal birth after cesarean) has become a popular method of delivery for several reasons. It is my understanding that many women who have had a C-section delivery can have vaginal deliveries. Depending on the reason for the prior C-section, “success rates” for VBAC deliveries range from about fifty to seventy percent. In addition to having the experience of a vaginal delivery, recovery time and risks for surgical complications (such as infection, bleeding, or injury to pelvic organs) are reduced.

However, in discussing this option with my health care provider, I understand that VBAC carries higher risks to me and my baby than were recognized in years past. I understand that during a VBAC, the uterine scar from an earlier C-section delivery may open, or “rupture,” sometimes causing heavy bleeding. I understand that such an event, while unlikely to happen, will likely result in injury or death—for my baby and/or myself.

My health care provider has explained that VBAC deliveries could be described as having “low individual risk, but high individual stakes.” In other words, a potentially catastrophic event such as uterine rupture is very unlikely to occur to me. But when such an event does happen, the results can be devastating for mother and/or baby. I have also been advised that a rupture of the uterus may occur with little or no warning to my health care team or me.

It is with this understanding that I acknowledge the following:

1. I understand that I have the following options:
   • having an elective (planned) cesarean delivery, or:
   • attempting a vaginal birth after cesarean (VBAC).

2. I understand that vaginal birth after cesarean (VBAC) carries higher risk to me and my baby than does elective (planned) C-section delivery.

3. I understand that certain factors may make VBAC success more likely. (For example, in women who had prior cesareans because of breech presentation or an active herpes infection, VBAC is more likely to succeed than in women who had cesarean deliveries because of a “poor fit” between mother’s pelvis and the size of the baby.) My health care provider and I have discussed the reason(s) for my earlier C-section(s), and how those reasons could impact the chances for a successful VBAC in my current pregnancy.

4. I understand that all methods of delivery carry a small risk of harm and potential complications to both mother and baby.

5. I understand that the risk of a uterine rupture during a VBAC in someone such as myself, who has had a prior incision in the noncontracting part of the uterus, is about one percent.

6. I understand that if my uterus ruptures during my VBAC attempt, there may not be sufficient time to operate and to prevent the death of or permanent brain injury to my baby.
7. I understand that if my uterus ruptures, I am at risk of hemorrhage (severe blood loss). While measures such as hysterectomy may be attempted, I understand that hemorrhage may be life-threatening to me. I recognize that there may not be sufficient time to intervene in such an emergency.

8. On the other hand, I recognize that if I deliver vaginally, I will most likely have fewer problems after delivery and a shorter hospital stay than if I have a C-section. And I recognize that there are complications associated even with elective (planned) C-sections.

9. I understand that if I elect to have a VBAC, the use of oxytocin (Pitocin) hormone to make my uterus contract may be necessary to assist me in my vaginal delivery, and the risks of this drug have been thoroughly explained to me.

10. I acknowledge that if I attempt a VBAC and end up having a C-section during labor, I have a slightly greater risk of complications than if I had had an elective (planned) C-section. In other words, I understand that a planned surgery carries less risk to me and my baby than an emergency surgery.

11. I acknowledge that the decision to have a VBAC is entirely my own, and the option of an elective (planned) C-section has been offered and discussed with me.

I consent to the administration of anesthesia or other medications before, during, or after the procedure by qualified medical personnel.

I understand that all anesthetics involve the rare potential of risks or complications such as damage to vital organs like the brain, heart, lungs, liver, and kidneys; paralysis; cardiac arrest; and/or death from both known and unknown causes.

I have chosen to undergo this procedure after considering the alternative forms of delivery including a cesarean section. Each of these alternative forms of delivery has its own potential benefits, risks, and complications.

I certify that I have read or had read to me the contents of this form. I have read or had read to me and will follow any patient instructions related to this procedure. I understand the potential risks, complications, and side effects involved with any medical or surgical treatment or procedure and have decided to proceed with this procedure after considering the possibility of both known and unknown risks, complications, side effects, and alternatives to the procedure. I declare that I have had the opportunity to ask questions, and all of my questions have been answered to my satisfaction. After discussing the matter with my health care provider:

☐ I want to attempt a VBAC.

☐ I want a repeat C-section.

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Postdating

Introduction

Up to 30% of obstetric malpractice claims involve pregnancies progressing past 42 weeks’ estimated gestational age. Clearly, postdates pregnancies require closer management by physicians and obstetrical staff.

The maximum normal duration of pregnancy is considered 42 weeks from a normal last menstrual period followed two weeks later by ovulation. The approximately 10% of pregnancies continuing past 42 weeks are at risk for continued growth resulting in macrosomia and shoulder dystocia, or conversely, in placental insufficiency with possible growth restriction, meconium aspiration, and fetal distress. Efforts to counter the hazards of postdatism, such as antenatal testing, induction of labor, and cesarean delivery, may be associated with increased expense and the inherent risks of inappropriate interventions.

While no plan of assessment and management is universally accepted, accurate dates must be established and regularly reviewed. A definite clinical plan for management must be formulated, documented, and pursued.

Etiology

It is possible that a pregnancy designated as postdates is in fact of mistaken or uncertain gestational age. As described below, expectant management may be indicated in this situation. For the remainder of truly postdates pregnancies, the cause is idiopathic except in rare cases of decreased placental estrogen production, such as that associated with anencephaly, fetal adrenal hypoplasia, and placental sulfatase deficiency.

Risks

Normal placental function leads to the possible development of a macrosomic fetus with its attendant complications. Macrosomia is associated with increased risk of cesarean delivery (up to 30%), difficult vaginal birth, and consequent increased maternal morbidity. Shoulder dystocia increases fetal risk for brachial plexus injuries, clavicular fracture, neonatal asphyxia, and death.

When placental insufficiency develops, oligohydramnios increases the risk of meconium aspiration, and predisposes to cord compression with fetal distress and occasionally fetal death. Fetal growth restriction (postmaturity syndrome) is characterized by the dysmature neonate with weight loss, subcutaneous fat and muscle loss, and cutaneous desquamation.

Meconium-stained amniotic fluid is present in approximately 10–15% of normal term pregnancies. This incidence increases to as high as 30% after 42 weeks. When associated with decreased amniotic fluid volume and fetal distress, the incidence of meconium aspiration with the attendant neonatal morbidity and mortality greatly increases.

Management

Dating

The best opportunity to reduce the risks of postdatism occurs at the time of the patient’s first visit for prenatal care. The provider must obtain and critically evaluate dating parameters. Accurate dating is established by:

◆ Careful menstrual history
◆ Date of conception, if known
◆ Date of last menstrual period
◆ Onset of symptoms
◆ Date(s) of pregnancy test(s) (positive and/or negative)
◆ Uterine size at the earliest pelvic exam
◆ Serial fundal height measurements
◆ The presence of fetal heart tones at 10–12 weeks with Doppler; at 17–20 weeks with a fetoscope
◆ Early ultrasound
Any discrepancy should prompt an ultrasound evaluation, which is best conducted in the first trimester, when studies are accurate +/- five days. Although later discrepancies in size and dates should prompt further evaluation, ultrasound studies conducted in the second and third trimester are progressively less accurate (+/- 3 weeks at term). The estimated date of confinement (EDC) based on accurate early first-trimester information should not be changed based on later ultrasound dating.

**Antepartum**

A recent survey of institutions providing perinatology fellowships failed to show agreement concerning any particular plan of management. Nonetheless, when pregnancy continues past 41–42 weeks, a definite plan of management should be established and communicated to all providers involved in the patient’s care. Choices include careful fetal surveillance, AFI and NST twice weekly or induction of labor.

Expectant management may be appropriate if the cervix is unfavorable and the pregnancy is otherwise uncomplicated. Alternatively, cervical ripening with prostaglandin may be a consideration. Although there is no perfect strategy for fetal surveillance that will prevent all fetal deaths, twice weekly non-stress testing with amniotic fluid determinations is the strategy recommended by most clinicians. If expectant management is pursued, an endpoint for delivery should be established. A review of perinatal mortality associated with postdates concluded that induction of labor at 41 weeks’ gestation would minimize the incidence of stillbirth, as well as neonatal and infant mortality, without significant increases in cesarean delivery rate.

Induction is appropriate if the cervix is favorable. Expectant management with fetal surveillance is not appropriate in the presence of complications such as pregnancy-induced hypertension or growth restriction. Active intervention is also indicated for a non-reassuring non-stress test, significant fetal heart rate decelerations, or oligohydramnios.

Have a plan for management of postdates pregnancies. Discuss the plan with your patient and make certain it is accurately expressed to all potential care providers. Begin testing for fetal well-being by 41–42 weeks. Pregnancies complicated by diabetes, pregnancy-induced hypertension, oligohydramnios, or other conditions known to compromise placental function may require earlier intervention.

**Intrapartum**

All potential risks and options should be discussed in detail with the patient. Because of the increased possibility of macrosomia, an attempt should be made to estimate fetal weight, and this estimate should be charted on admission.

Due to the increased risk of fetal distress, continuous electronic fetal monitoring is advisable. In general, amniotomy should be carried out as early as possible to evaluate the amniotic fluid for meconium, and to allow application of an internal electrode and intrauterine pressure catheter. Amnioinfusion can be utilized in those cases where thick meconium is present or the fetal heart rate pattern is nonreassuring, suggesting possible cord compression.

Use of a labor curve will more readily identify dysfunctional labor patterns and abnormal progress. Instrumental delivery should be avoided in the face of an abnormally protracted labor or if there are other indicators associated with shoulder dystocia. (See “Shoulder Dystocia” on page 3.) Antici-
pate possible consequences of dysfunctional labor and traumatic delivery, including cervical/vaginal lacerations, postpartum hemorrhage, and infection. Anticipating the possible need for assistance from Anesthesiology/Neonatology/Pediatrics can save valuable time.

Risk Reduction in Postdates

Key Points
◆ Date the pregnancy accurately as early as possible. First-trimester information is the most accurate, although an ultrasound at 16–18 weeks provides excellent dating as well as more complete anatomical information.
◆ At 41–42 weeks:
  • Antepartum fetal surveillance with non-stress testing and amniotic fluid index
  • Favorable cervix: induction unless contraindicated
  • Unfavorable cervix: consider cervical ripening
  • Delivery if nonreassuring fetal tests
◆ Have a plan of management and communicate the plan clearly to all providers sharing in responsibility for the patient’s care (e.g., shared call).
◆ Monitor postdates carefully. Consider amnioinfusion for nonreassuring fetal heart rate patterns or thick meconium.
◆ Anticipate the possible need for Pediatric/Neonatology/Anesthesiology help.

References

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Examination of the Placenta

Guidelines and Indications

Careful examination of the placenta has several goals:

◆ Diagnostic (of problems during pregnancy and labor, and of abnormalities in the infant)
◆ Prognostic (for development of problems in subsequent pregnancies)
◆ Medicolegal (to provide objective information related to adjudication of malpractice suits for adverse neonatal outcome)

The College of American Pathologists (CAP) has formulated guidelines for examination of the placenta, including a listing of the indications for pathologic examination (1, 2, 3). These guidelines are only recommendations for patient management and should not be considered invariable standards of practice. The reader is referred to Reference 1 for complete details.

I. Gross Examination of All Placentas

All placentas should be examined grossly and triaged; those which fulfill specific indications should be further examined by a pathologist. Ideally, the triage examination should be performed in the delivery room, since the delivering obstetric practitioner is in the best position to determine which placentas should be sent for further pathologic examination. An alternative triage site is the pathology laboratory.

A minimum gross examination should include:

◆ Measurement of total umbilical-cord length, including the portion attached to the newborn, and determination of the number of cord vessels and site of insertion
◆ Determination of placental weight and measurement of disc size in 3 dimensions
◆ Careful observation and palpation, with attention to:
  - Integrity of disc and completeness of maternal surface
  - Appearance and completeness of fetal membranes
  - Any gross abnormalities or unusual appearance of fetal or maternal surface, membranes, or umbilical cord
◆ Distinctive identification of the umbilical cords of multiple gestations (clamps, for example)

The results of the gross examination should be recorded in the maternal chart in a standard fashion. One way to facilitate recording is to incorporate a standardized checklist of placental findings into the delivery room record, to be filled out for each birth. These findings should also accompany the specimen to the pathology laboratory.

A more detailed pathologic examination (gross and microscopic) of the placenta may be indicated because of fetal or maternal complications of pregnancy, labor or delivery; grossly evident abnormalities of the placenta; or medicolegal/risk management concerns. The CAP guidelines include a compilation of recommended and other indications for placental examination by pathology (see III below). Each institution should establish its own list of indications for placental examination, using these guidelines as a basis. No list should be considered inclusive, however, and the obstetric practitioner should refer for pathologic examination any placenta about which he or she has concerns, with respect to the pregnancy and outcome.
A request for pathologic examination of the placenta should accompany the placenta to the pathology laboratory and provide the following information:

- Obstetrical history
- Gestational age, route of delivery
- Infant weight and sex
- Apgar scores at 1 and 5 minutes
- Umbilical-cord length
- Data from the triage examination
- Reason for submission (checklist used for efficiency)
- Any specific questions for the pathologist to address
- Name of the delivering physician and, if known, the infant’s pediatrician

Some studies require that fresh tissue be obtained in a timely fashion. Ideally, cultures for bacteria or viruses, as well as tissue for cytogenetic study (for example, confined placental mosaicism) or for special metabolic studies (frozen), should be obtained in the delivery room as soon as possible after delivery. Cultures are obtained by separating amnion from chorion, and using a sterile swab beneath the amnion.

II. Handling, Transport, and Storage of All Placentas

Placentas should remain unfixed (fresh) until after triage. Those that meet indications for further examination should have any clinically indicated studies performed using fresh tissue (culture, cytogenetics, etc.) prior to formalin fixation. It is optimal to obtain fresh tissue specimens in the delivery room.

All placentas not submitted initially for pathologic examination can be stored fresh for at least 3 days (3–7 day range), in labeled, individual containers, refrigerated at 4°C. Refrigeration allows for later request for pathologic examination if clinical indications emerge. Avoid the freezing of placentas.

III. Indications For Pathologic (histologic) Examination of the Placenta (Reference 1)

These are general lists of indications for placental examination and should not be considered inclusive. Each institution should establish its own list of indications for placental examination, based on consultation with pathologists, obstetric practitioners, and neonatologists. Unless noted, these indications are based primarily on the CAP guidelines, which were formulated from both the medical literature and a survey of placental pathology experts. Expert opinion and scientific literature were in agreement for the recommended indications; there was less agreement on the indications listed as “other.”

Maternal Indications

Recommended
- Systemic disorders with clinical concerns for mother or infant (e.g., severe diabetes, impaired glucose metabolism, hypertensive disorders, collagen vascular disease, seizures, severe anemia [<9 g/l])
- Premature delivery <34 weeks’ gestation
- Peripartum fever and/or infection
- Unexplained third-trimester bleeding or excessive bleeding >500 cm³
- Clinical concern for infection during this pregnancy (e.g., HIV, syphilis, CMV, primary herpes, toxoplasma, or rubella)
- Severe oligohydramnios
- Unexplained or recurrent pregnancy complication (IUGR, stillbirth, spontaneous abortion, premature birth)
◆ Invasive procedures with suspected placental injury
◆ Abruption
◆ Nonelective pregnancy termination
◆ Thick/viscid meconium

Other
◆ Premature delivery from >34 weeks’ to <37 weeks’ gestation
◆ Severe unexplained polyhydramnios
◆ History of substance abuse
◆ Gestational age ≥42 weeks
◆ Severe maternal trauma
◆ Prolonged (>24 hours) rupture of membranes

NOTE: Delivery by cesarean section is not an indication for submission of the placenta for pathologic examination.

Fetal/Neonatal Indications

Recommended
◆ Admission or transfer to other than Level I nursery
◆ Stillbirth/perinatal death
◆ Compromised clinical condition defined as any of the following:
  - Cord blood pH <7.0
  - Apgar score <6 at 5 minutes
  - Ventilatory assistance >10 minutes
  - Severe anemia (Hct <35%)
◆ Hydrops fetalis
◆ Birth weight <10th percentile (IUGR)
◆ Major congenital anomalies, dysmorphic phenotype, or abnormal karyotype
◆ Discordant twin growth (>20% weight difference)
◆ Multiple gestation with like-sex infants and fused placentas

Other
◆ Birth weight >95th percentile
◆ Asymmetric growth
◆ Multiple gestation without other indication
◆ Vanishing twin beyond the first trimester
◆ Following therapeutic/diagnostic intervention in utero (not a CAP indication)

Placental Indications

Recommended
◆ Any gross abnormality or unusual appearance of the placenta, membranes, or umbilical cord. This includes, but is not limited to: infarct, mass, vascular thrombosis, retroplacental hematoma, amnion nodosum, abnormal coloration or opacification, bad odor, umbilical-cord thrombosis, torsion, true knot, single artery, absence of Wharton’s jelly.
◆ Small or large placental size or weight for gestational age (<350 g or >750 g at term)
◆ Total umbilical-cord length <32 cm at term

Other
◆ Abnormalities of placental shape
◆ Long cord (>100 cm)
◆ Marginal or velamentous cord insertion

Although these indications will identify the majority of placentas that should be sent for examination, pathological examination of the placenta should be considered in any case in which there is reason to suspect an abnormal pregnancy, delivery, or infant, or if there is concern about potential litigation.
IV. Histologic Examination of the Placenta

Histologic examination should include the following procedures:

◆ For routine, normal-appearing placenta, use 3 blocks:
  – Umbilical cord: 2 sections, near placenta and near fetus
  – Membrane roll with peripheral placental attachment
  – Two full-thickness villous tissue sections, including fetal and maternal surface, from separate areas (cotyledons) in the central placenta

◆ In addition, submit representative sections of grossly identified lesions (may use en face section for maternal vasculature).

◆ For placentas with unusual findings, use more blocks.

◆ For twin or higher multiple gestations, sample the component placentas as with singletons, with the addition of a section of each dividing membrane.

References


The Obstetrical Task Force and Physicians Insurance wish to acknowledge the contribution of the following pathologists to this chapter:

Michael W. DeTar, M.D.

Raj P. Kapur, M.D., Ph.D.

Richard H. Knierim, M.D.

Selig Leyser, M.D.
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**Indications For Pathologic Examination Of The Placenta**

Based On Cap Practice Guidelines, 1997

**Reference:** Arch Pathol Lab Med. 1997;121:449-476

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**Recommended**

◆ Any gross abnormality or unusual appearance of the placenta, membranes, or umbilical cord. This includes, but is not limited to: infarct, mass, vascular thrombosis, retroplacental hematoma, amnion nodosum, abnormal coloration or opacification, bad odor, umbilical-cord NOTE: Delivery by cesarean section is not an indication for submission of the placenta for pathologic examination.
thrombosis, torsion, true knot, single artery, and absence of Wharton’s jelly.

- Small or large placental size or weight for gestational age (<350 g or >750 g at term)
- Short cord (total umbilical-cord length <32 cm at term)

Other
- Abnormalities of placental shape
- Long cord (>100 cm)
- Marginal or velamentous cord insertion

Pathological examination of the placenta should be considered in any case in which there is reason to suspect an abnormal pregnancy, delivery, or infant, or concern about potential litigation.
Neonatal Resuscitation

Preparation for the Depressed Neonate

Inadequate resuscitation efforts have increasingly been cited as the cause of neonatal morbidity or mortality. Birth asphyxia accounts for nearly 19% of the approximately 5 million neonatal deaths that occur each year worldwide. This observation is sobering, given the fact that approximately 10% of newborns require initial life support at birth, and about 1% need extensive resuscitative measures to survive. Medical personnel attending deliveries must therefore anticipate resuscitation for an asphyxiated or depressed infant. Recognizing the need that “at least one person skilled in neonatal resuscitation should be in attendance at every delivery,” and “an additional skilled person should be readily available,” the American Heart Association and the American Academy of Pediatrics established the Neonatal Resuscitation Program, which is endorsed by the American College of Obstetrics and Gynecology, the American Academy of Family Physicians, and the American Society of Anesthesiology. A recent study documented improved outcomes for high-risk neonates where providers have completed the Neonatal Resuscitation Program.

The Neonatal Resuscitation Program is required in many institutions in Washington State for those who deliver infants. The advantage of this training is obvious—techniques mastered in the program help caregivers provide for the best outcome to newborns. Keeping these skills sharp is an additional challenge, especially in settings where they are infrequently required. The following strategies are recommended:

- Be sure that all delivering physicians, in addition to anesthesiologists, nurses, and respiratory therapists involved in newborn care, successfully complete the Neonatal Resuscitation Program. Provide mock resuscitation codes on a regular basis.
- Regularly inspect the equipment and medications necessary for newborn resuscitation.
- Establish hospital policy that clearly identifies the personnel with primary responsibility for the actual resuscitation. Establish procedures for recruiting additional help if necessary. These policies should adhere to practice guidelines of other specialties. For example, an anesthesiologist providing maternal anesthesia who is present at a delivery may be asked to provide assistance in a resuscitation. However, the anesthesiologist’s primary responsibility is to provide care for the mother according to practice guidelines of the American Society of Anesthesiology.
- Place visual aids in the delivery area to remind care providers of the critical steps to follow in the assessment and management of the newborn. The enclosed poster provides an overview of resuscitation in the delivery room.

Resuscitation of the Newborn is
Divided into 4 Major Steps:

1. Stabilize the infant and minimize heat loss.
   Asphyxiated infants have unstable thermoregulatory systems, and recovery from acidosis is delayed with hypothermia. Dry off the infant under a radiant warmer, position the infant in a supine or lateral position with neutral head position, and suction the mouth and nose—a process which should take approximately 20 seconds. If meconium is present in the amniotic fluid or on the infant’s skin, suction the mouth, nose, and posterior pharynx after delivery of the head, but before delivery of the shoulders. If meconium aspiration is suspected, proceed with tracheal suctioning.

2. Assess neonatal respiration within 30 seconds of birth.
   If the infant is gasping or apneic, begin positive pressure ventilation with 100% O₂ bag-valve mask at a rate of 40-60 breaths per
minute. Initial lung inflation may require pressures of 30-40 cm H₂O or greater. Observe chest-wall movement and auscultate over the axillae to confirm adequate ventilation. If positive pressure ventilation is not successful initially, reposition the face mask to improve the seal, administer further suctioning, and increase inflation pressures. If bag and mask ventilation is not adequate after these maneuvers, proceed with immediate endotracheal intubation for ventilation.

3. Assess neonatal heart rate.
   It is very rare that neonatal resuscitation requires chest compression if the neonate is adequately ventilated. Neonatal cardiac arrest is usually secondary to respiratory failure. Tissue hypoxia and acidosis from inadequate ventilation eventually result in bradycardia and cardiac arrest. Perform chest compressions if the neonate’s heart rate is less than 60, despite adequate ventilation with 100% O₂ for 30 seconds. Guidelines recommend 90 compressions per minute at a 3:1 ratio of compressions interposed with ventilation. This provides 30 unobstructed breaths per minute.

4. Administer medications.
   Medications should be given if the heart rate remains below 60 after giving 30 seconds of assisted ventilation, and another 30 seconds of coordinated chest compressions with ventilation. An overview of resuscitation, as well as medications, doses, and routes of administration, are given in the Appendix.

RESUSCITATION REQUIRES A REPEATED, SIMULTANEOUS ASSESSMENT OF RESPIRATIONS, HEART RATE, AND COLOR.

While this information cannot substitute for the more extensive instruction contained in the Neonatal Resuscitation Program, it may serve as a refresher to those who have taken the program. Care providers may find it useful to prepare for each delivery as though the anticipated newborn will require resuscitation. Check the warmer; the suction equipment; bag-valve mask device, oxygen source and manometer; laryngoscope with proper-sized blade and functional bulb; and appropriate endotracheal tube for gestational age or anticipated weight.

Anticipate A Depressed Infant In Circumstances Such As Deliveries Complicated By But Not Limited To:

1. Fetal distress noted during fetal monitoring
2. Chorioamnionitis
3. Meconium
4. Multiple birth
5. Forceps/instrument delivery
6. Breech presentation
7. Congenital anomalies
8. Prematurity
9. Recent narcotic use by mother
10. Exposure to magnesium sulfate
11. Vaginal bleeding, including placental abruption and placenta previa
**Mock Codes**

Even in the best of hospitals, intensive resuscitation efforts for newborns are all too often unanticipated events. Any delay in establishing effective cardiorespiratory function increases the potential risk for hypoxic-ischemic cerebral injury, pulmonary arterial hypertension, and systemic organ dysfunction.

Since intensive resuscitation of neonates is usually infrequent and often unanticipated, clinical expertise and working as part of a proficient team are critical skills to be learned or maintained.

Implementing mock codes as part of your hospital’s regular routines is an easy and effective way to maintain these skills.

**Practice Makes Perfect**

Performing mock codes in your institution can provide many benefits for staff and meet performance standards for continuous quality-improvement projects for JCAHO audits! Some of the benefits include the following:

- By using resuscitation scenarios, clinical skills can be learned or maintained and practiced in a fun way on a regular basis.
- Individuals from different disciplines learn to interact with each other through role-playing.
- Clinical decision making can be practiced in a relatively uncharged situation using various what-if scenarios, such as “What would you do if you were ruling out pneumothorax?” “What would the baby look like?” and “What clinical signs would you watch for?”
- Various systems and equipment problems can be identified and improved upon before a real code occurs.

**The Nuts and Bolts of Setting Up Mock Codes**

Following are suggestions from different institutions to facilitate the process of setting up mock codes, and to assist you with formulating a plan of action.

Schedule mock codes often enough that different personnel can rotate through. Quarterly mock codes are probably enough to refresh your skills without becoming overdone. Whenever possible, make the mock codes interdisciplinary. If your institution utilizes a designated high-risk team or a group of neonatologists, involve them as experts in the planning, implementation, and evaluation phases as much as possible. Other disciplines that might be involved include respiratory therapy, pharmacy, and anesthesia.

Encourage all Birth Center personnel to participate. Post memos ahead of time and send them to individual physicians to encourage participation. Additionally, send memos to staff scheduled for the day of the event to remind them they may be asked to participate.

Designate one person to lead the code. For ease of scheduling, consider designating the physician on call for that day.

Plan a scenario in advance to provide the team with some background information. For example:

_This 30 y.o. G2 P1 female at 32 weeks’ gestation arrived at 1630 after being involved in an automobile accident. FHTs were found to be in the 90s on arrival and stat C/S was performed. Baby is now delivered at 1650 and is blue and limp. No respiratory effort is noted; an initial HR is 60. What do you do?_

The person providing the scenario could be the medical director, neonatologist, or anyone having advanced neonatal skills. This person continues to provide information, and acts as an observer in order to assist with debriefing after the code is completed.
Use actual supplies as much as possible. This allows people to practice skills, such as drawing up and giving epinephrine via an endotracheal tube, as well as assessing, for instance, whether supplies are available, easy to find, and in correct dosages.

To take the anxiety out of role-playing, roles can be drawn out of a hat along with key points or directions. This allows for some spontaneity and prevents an “experts only” code from happening (see “Mock Code Roles” on p. 40).

Include charting as part of the code. Charting can be done on, or transcribed to, a code form and evaluated for completeness (see “Infant Code Record” on p. 43).

Debriefing after a mock code is critical to the overall success of the program. Questions to encourage participation include:

◆ What went well?
◆ What didn’t go as well?
◆ What needs to be worked on?
◆ Did we have the right personnel/supplies/equipment?
◆ Did everyone understand his or her role (and was it performed correctly)?

Use the debriefing session as a means to impart information and bolster interdepartmental communication. One word of caution: Overzealousness in focusing on “what went wrong” or placing blame could impart bad feelings among team members. The best rule of thumb is to provide “gentle direction for correction” and focus on systems changes or types of communication that work well.

Performing mock codes in your institution can only serve to enhance the performance of the resuscitation team and provide a template for actual skills review. It also serves as a way for people to get to know each other’s skill level and expertise, and to practice working as a team, before that next unanticipated code occurs at your institution.

Key Points for Preparedness in Neonatal Resuscitation

◆ Require delivering physicians and others attending deliveries to successfully complete the Neonatal Resuscitation Program (AHA, AAP) with regular—consider yearly—recertification.
◆ Ensure proper equipment and regular inspection by a staff member who has successfully completed the Neonatal Resuscitation Program.
◆ Review equipment prior to delivery:
  a. Warmer
  b. Towels
  c. Suction equipment
  d. Bag-valve-mask device, manometer, and oxygen source
  e. Laryngoscope with proper-sized blade, and functional bulb with stylette
  f. Endotracheal tube of appropriate size
  g. Stethoscope
◆ Review the Overview of Resuscitation schema in the delivery room.
◆ Practice mock resuscitation codes with personnel on a regular basis.

Conclusion

In a sense, all infants require resuscitation. While most require only the first few steps of the process (e.g., placement under a radiant heat source, drying, positioning, suctioning, and stimulation), others require further steps in the scheme. Reviewing the process of resuscitation and preparing for each delivery as suggested takes a few minutes—minutes that will ensure the best possible outcome after delivery.
References


Special thanks to Elsa Spicochi, R.N., for her mock-code expertise and assistance in writing this review.
### Mock-Code Roles

The following mock-code roles, along with the key points associated with each role, may be cut up and drawn out of a hat. Two Helper and Observer roles are included for use when practical.

<table>
<thead>
<tr>
<th>Roles</th>
<th>Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPR—Compressions</td>
<td>key points: rate, depth, position on chest, when to start or stop</td>
</tr>
<tr>
<td>CPR—Ventilation</td>
<td>key points: rate, position of bag and mask, troubleshooting if inadequate chest rise, coordinate with compressions</td>
</tr>
<tr>
<td>Medications</td>
<td>key points: calculate doses, label syringes, anticipate medication needs</td>
</tr>
<tr>
<td>Recorder</td>
<td>key points: VS, meds given (drug, dose, route, and time), labs, lines placed, intubation (time, size of ETT, cm marking @ lip)</td>
</tr>
<tr>
<td>Helper</td>
<td>key points: phone calls (supervisor, RT, pharmacy, lab), VS with BP, chems, opening/locating equipment, pushing drugs, running labs</td>
</tr>
<tr>
<td>Helper</td>
<td>key points: phone calls (supervisor, RT, pharmacy, lab), VS with BP, chems, opening/locating equipment, pushing drugs, running labs</td>
</tr>
<tr>
<td>Observer</td>
<td>key points: provide information, evaluate CPR compression and ventilation rates, medication administration, code sheet filled out by the recorder. Note where the code ran smoothly and areas for improvement.</td>
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<td>key points: provide information, evaluate CPR compression and ventilation rates, medication administration, code sheet filled out by the recorder. Note where the code ran smoothly and areas for improvement.</td>
</tr>
</tbody>
</table>
### Stabilization Chart

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Normal Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>98–98.6°Fahrenheit</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>120–160 Beats per Minute</td>
</tr>
<tr>
<td>Respiratory Rate</td>
<td>40–60 Breaths per Minute</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>1.5–2.5 kg infant: systolic &gt;43</td>
</tr>
<tr>
<td></td>
<td>&gt;2.5 kg infant: systolic &gt;52</td>
</tr>
<tr>
<td>Peripheral Perfusion</td>
<td>Capillary filling time &lt;3 seconds</td>
</tr>
<tr>
<td>Blood Gases</td>
<td>Capillary: 7.35–7.45, pCO₂ 35–46, pO₂ &gt;45</td>
</tr>
<tr>
<td></td>
<td>Arterial: 7.35–7.45, pCO₂ 35–45, pO₂ &gt;70</td>
</tr>
<tr>
<td>Blood Sugar</td>
<td>Chemstrip or Dextrostix: &gt;40</td>
</tr>
<tr>
<td></td>
<td>Blood Sugar: &gt;40</td>
</tr>
<tr>
<td>Pulse Oximetry (SaO₂)</td>
<td>Greater than 95% pre- and postductally</td>
</tr>
</tbody>
</table>

Consult your local guidelines—normal values may vary from institution to institution.

### References

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<table>
<thead>
<tr>
<th>TIME</th>
<th>HEART RATE</th>
<th>RESPIRATION RATE</th>
<th>BLOOD PRESSURE</th>
<th>FEMORAL PULSES</th>
<th>SI SATE</th>
<th>INTRAVENOUS MEDS</th>
<th>GLUCOSE</th>
<th>EPHRENAPINE</th>
<th>NASOCONC.</th>
<th>SALINE</th>
<th>MARCON</th>
<th>DOPEMY</th>
<th>OUTCOME</th>
</tr>
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<tbody>
<tr>
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</tbody>
</table>

**VITAL SIGNS**

- **HEART RATE**
- **RESPIRATION RATE**
- **BLOOD PRESSURE**
- **FEMORAL PULSES**
- **SI SATE**

**INTRAVENOUS MEDS**
- **GLUCOSE**
- **EPHERAPINE**
- **NASOCONC.**
- **SALINE**
- **MARCON**

**INFUSIONS**
- **DOPEMY**

**OUTCOME**
- Code terminated by
- Code terminated at

**PATIENT'S RESPONSE**
- Lab Results
- Procedures (Foley, taps, CXR)
- Appearance/activity (color, mental status, neuro checks, pupils, seizures, etc.)
- Urine Output

**SAMPLE**

**INFANT CODE RECORD**

BMH NUR 277 (4/95)
**Neonatal Resuscitation Program - Reference Chart**

The most important and effective action in neonatal resuscitation is ventilation of the baby's lungs with oxygen.

### Endotracheal Intubation

<table>
<thead>
<tr>
<th>Gestational Age (weeks)</th>
<th>Weight (kg)</th>
<th>ET Tube Size (ID, mm)</th>
<th>Depth of Insertion* (cm from upper lip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;28</td>
<td>&lt;1.0</td>
<td>2.5</td>
<td>6·7</td>
</tr>
<tr>
<td>28·34</td>
<td>1.0·2.0</td>
<td>3.0</td>
<td>7·8</td>
</tr>
<tr>
<td>34·38</td>
<td>2.0·3.0</td>
<td>3.5</td>
<td>8·9</td>
</tr>
<tr>
<td>&gt;38</td>
<td>&gt;3.0</td>
<td>3.5·4.0</td>
<td>9·10</td>
</tr>
</tbody>
</table>

*Depth of insertion (cm) = 6 + weight (in kg)

### Medications for Neonatal Resuscitation

<table>
<thead>
<tr>
<th>Medication</th>
<th>Concentration</th>
<th>Preparation</th>
<th>Dosage/Route**</th>
<th>Rate/Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epinephrine</td>
<td>1:10,000</td>
<td>1:10,000 solution in 1 mL syringe</td>
<td>0.01 - 0.03 mg/kg (0.1 - 0.3 mL/kg)</td>
<td>ET or IV Give rapidly Flush catheter/ET tube with 0.5 - 1 mL normal saline</td>
</tr>
<tr>
<td>Volume expanders (recommended)</td>
<td>Normal saline</td>
<td>Ringer’s Lactate 0.9% negative blood</td>
<td>Estimated volume drawn into large syringe(s)</td>
<td>10 mL/kg IV (Umbilical vein) Give over 5-10 minutes</td>
</tr>
<tr>
<td>Sodium Bicarbonate (0.4% solution)</td>
<td>0.5 mEq/mL</td>
<td>Estimated volume drawn into prefilled or prepared syringe(s)</td>
<td>2 mEq/kg (4 mL/kg) IV only (Umbilical vein) Give slowly over at least 2 minutes (1mEq/kg/min) Give only if newborn is being effectively ventilated</td>
<td></td>
</tr>
</tbody>
</table>

**Postresuscitation medications (including post delivery room):**

- **Naloxone hydrochloride**......0.1 mg/kg; give rapidly; IV or ET (preferred); IM, SQ (acceptable) for narcotic-induced respiratory depression
- **Glucose/D10W**.........2 mL/kg (200 mg/kg) IV over 1 - 2 minutes; followed by continuous IV glucose infusion for hypoglycemia
- **Phenobarbital (for seizures)**......20mg/kg slow IV push (1 mg/kg/min); may depress respiratory effort
- **Dopamine (for hypotension)**......2 - 20 mcg/kg/min by continuous IV infusion

**Drip Calculation:** 6 X Wt (kg) X desired mcg/kg/min = mcg in 100 mL DSW desired ml/hr

**IM - Intramuscular; ET - Endotracheal; IV - Intravenous; SQ - Subcutaneous**

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*Endotracheal intubation may be considered at several steps.*

The recommendations in this publication do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.
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The Morbidity and Mortality Conference

One of the most effective risk management tools is the learning that occurs when physicians gather to discuss their own difficult or challenging cases. Cases occurring within a hospital setting hold a natural appeal for discussion, making the regularly scheduled Morbidity and Mortality (M & M) Conference an ideal opportunity for educational exchange. These conferences are particularly applicable to the obstetric service.

To Set Up an M & M Conference at your Practice Site, We Recommend the Following:

- Schedule meetings on a regular basis, monthly or bimonthly.
- Encourage attendance through announcements and provision of refreshments.
- Ask fellow physicians and nurses to place their more challenging cases in a log kept on the delivery suite.
- Target cases from the preceding time interval.
- Invite participation from all providers on the maternity service.
- Ask the attending physician to present each case for discussion.
- Rotate responsibility for choosing cases and developing the agenda.
- Emphasize the educational focus.

During the first few meetings, accentuate the instructional nature of the conference. Physicians may initially feel reluctant to actively critique one another’s work, or to discuss their difficult cases in the presence of the nursing staff. Hesitation tends to dissipate, however, in a nonpunitive atmosphere that focuses on the goal of improved patient care. Even professional jealousies can be overshadowed by the esprit de corps that develops from a mutually cooperative working relationship.

The underlying objective of the conference should always be improving the quality of care. Because they are not intended as a peer review process, the meetings should not be an official function of the medical staff. To allay concern about peer review implications and the discoverability of the discussions, the meetings should not be burdened by documentation.

The Morbidity and Mortality Conference is a powerful vehicle for the enhancement of quality obstetric care. We strongly recommend regular M & M Conferences and the participation of all those involved in the care of the maternity patient.
Communication

What do air traffic control operations, nuclear power plants, and the best labor and delivery units have in common? Besides being complex technological systems that carry enormous risk, all three are able to function over relatively long time periods without mistakes. In addition, all three attribute their success to an emphasis on communication. Technical skills notwithstanding, it is interpersonal skills that make the real difference in effectively managing risk.

While the number of high-risk situations inherent in obstetrics may imply the inevitability of poor outcomes and frequent lawsuits, some institutions are proving that it is possible to operate with a high degree of success and patient satisfaction. The key to their success is collaboration among members of the delivery team.

Collaboration is like world peace: everyone wants it, yet few people believe it’s possible. Most everyone involved in obstetrics can describe the typical conflicts among obstetricians, family physicians, pediatricians, anesthesiologists, nurses, and midwives—but they are hard-pressed to describe how effective collaboration might work.

Considering the barriers to collaboration, it is no surprise that implementation is difficult:

◆ Our health care system is hierarchical, operating with superiors and subordinates rather than colleagues.
◆ Different methods of training for each medical discipline lead to misunderstandings of other practice styles or thought processes. A nurse, for instance, might judge a physician’s behavior by the standards of the nursing culture.
◆ Gender differences mirror differences in training. Men are typically more task-oriented than relationship-oriented. Women tend to focus on rapport building at least as much as they focus on tasks. As in the various health professions, both genders are socialized to different values yet judge the other’s behavior by their own values. That most physicians are male and most nurses are female only reinforces these differences in practice patterns and communication.

So how can the natural impasses between members of the delivery team be overcome?

While there is no one right way to communicate, collaborative skills can be learned. The following recommendations are intended to enhance the sense of teamwork in obstetrical departments:

◆ Increase your awareness of the communication styles particular to different medical specialties, as well as ancillary personnel.
◆ Encourage meetings that include all members of the delivery team, including midwives and anesthesiologists. Discussions should focus on areas needing refinements or improvement for the prevention of future problems. These reviews should be educational, blameless, and supportive of the individual providers. Note that labor and delivery units with the best track records recognize the potential danger of their successes—that is, the tendency of all working groups to take shortcuts when errors have not occurred for some time.
◆ Compromise. Adjust your communication style a bit to meet another practitioner halfway. Nurses can compromise by focusing on objective information in their reports to physicians, and making sure to state exactly what they need. Physicians can compromise by consciously building rapport with other staff members, as they would their patients.
◆ Respond to requests. Physicians who don’t hesitate to come to the hospital when called by a nurse at 2:00 a.m. will not only avoid potential disaster, but will increase collegial-
ity with obstetrical staff. They’ll also be better prepared to work with them during a crisis.

◆ **Support patient management in progress.**
You can have a great effect on the confidence your patients feel in their care by demonstrating respect for management already undertaken. Upon arriving at the patient’s bedside, you might say, “The midwife has called to let me know how your labor is progressing. She thinks you may need extra help with delivery and asked me to see what I think.” Statements such as this will lead to more trust and cooperation from other staff members. In the event of a difficult delivery, having presented a unified front may even prevent a lawsuit.

Collaboration may be hard work, and it may seem at times as elusive as world peace, but the effort you put into it tends to reinforce itself as benefits accumulate. You may find that, along with improvements in communication with others in labor and delivery, your own satisfaction with medicine increases.

**Rapport**

More collaboration on the obstetrical team may lead to better rapport with patients. Physicians often overlook the importance of rapport in their concentration on patient outcomes. Only when communication has come to a grinding halt may it be apparent that rapport with colleagues is as vital to obstetrical care as fetal monitoring.

Dissatisfaction with communication is the primary reason patients sue after a delivery has gone badly. You may find it difficult to believe that for most patients, communication takes precedence over technical competence until you consider how communication actually imparts a degree of technical competence by relaying information. Patients are generally far more eager for information than their physicians realize, and they want more detailed disclosures than their physicians usually offer. It is easy to assume, especially with well-educated patients, that they will ask for or otherwise obtain the information they seek, but patients generally don’t feel comfortable asking physicians for information.

A study published in 2001 found that patients want extensive discussions about risks, alternatives, and the adverse effects of prescribed medication. You can do a great deal to instill confidence in your medical care by providing written materials during the visit, and checking to ensure that questions have been answered. How many of these additional rapport-building techniques do you use with your patients?

◆ **Starting with a handshake:** This universal greeting is your best opportunity to establish connection. If the patient is lying down, you might lay a hand briefly on her shoulder.

◆ **Matching the patient’s posture and emotional state:** In order to maintain eye contact at a similar level, sit when your patient is sitting, or pull up a stool to the exam table if she’s lying down. When the patient is in obvious physical or emotional pain, you can convey your caring by acknowledging her situation and mirroring her posture without being drawn into the turmoil.

◆ **Active listening:** The power of listening cannot be overstated. Study after study has shown that taking a few uninterrupted minutes to listen to the patient’s story saves far more time in the long run. Remember to adjust your listening style as patients move from physical descriptions of their condition to the ways it is affecting them. Listen to symptoms in a fact-focused way, but be ready to respond empathetically if the description shifts to an expression of fear or concern.

◆ **Watching the jargon:** Imagine how a woman without a medical background might hear the terms “failure to progress,” “unremarkable pregnancy,” “dysfunctional labor,” or
“inadequate pelvis.” Obstetrics has its own language that new practitioners, eager to adapt to the culture, often use to the dismay of their patients. More experienced providers are also subject to inadvertent insensitivity. Listen to common phrases with an ear towards formulating less threatening alternatives. You might say “developed toxemia” rather than “became toxic,” or “nonprogressive labor” instead of “failure to progress”—and then describe the condition in lay terms. People are sensitive enough to failure that an expression containing the word “fail” or terms such as “trial of labor” or “trial of forceps” can have a judgmental ring.

Non-Adherence to Medical Advice

If a patient fails to follow your treatment plan and loses her baby as the result, can you be held accountable? Yes! Patients who don’t follow medical counsel are liability risks. Physicians are subject to blame for a patient’s disregard of their advice if the patient can convince a jury that the advice was unclear or never given. It is therefore in your own best interest to ensure that patients understand your recommendations, especially when the consequences of ignoring them are serious.

Protecting yourself from liability in this regard takes two forms. The first is to use every reasonable measure to encourage adherence, and the second is to document.

The following questions can serve as an adherence checklist:

♦ Did she understand? How easy it is to diminish the importance of “bed rest” the hundredth time you’ve recommended it! How easy it is for the patient herself to disregard the advice when she feels fine. In addition, anything you say to minimize anxiety may be easily misconstrued. Telling the patient that the mammogram is simply a reassurance might be heard as not being worth the effort and inconvenience.

Explaining the significance of your instructions increases the likelihood they’ll be followed. Providing written information is your best backup. It can help compensate for patients too shy to ask questions, or who may perceive you as too rushed to answer questions. Be aware of nonverbal signals you may be sending if you are feeling rushed or impatient, as well as technical language that might cloud understanding. Written recommendations can also convey important specifics such as what you mean by “light activity only” or symptoms that should prompt immediate action. You might ask your patient to summarize her understanding of the plan as a way to assure you both.

Finally, you might direct patients to your practice Web site as a means to educate them with evidence-based articles or links to other respected Web sites. This is especially useful for patients who arrive at appointments with a pile of printouts from less reputable sites.

♦ Did she agree? Many patients have their own opinions about what’s causing their symptoms or what treatment they should follow. Eliciting their beliefs is the best way to gain their cooperation. Consider asking them from the start whether they have anything in mind that might help with diagnosis or treatment. Sharing your own thoughts during the history taking and exam is another technique. You might finish with, “How closely do my recommendations match what you were thinking?”

♦ Did she remember? Understanding and agreement will still lead to non-adherence if the patient forgets important elements in your recommendation. Again, written materials will reinforce your message, supply details, and help patients explain their treatment to family and friends.
◆ Did she change her mind? A story on the evening news or a phone call from a friend can derail a treatment program to which your patient had previously agreed. Acknowledge to patients that it’s common to have second thoughts and ask them to call your office before changing any part of the plan.

◆ Is there a language barrier? You are obligated to provide interpretive services for patients with limited English proficiency. Hospitals often have qualified interpreters who can assist. The AT&T Language Line can connect you toll-free to interpreters in 140 languages. Document the name and relationship of anyone who interprets for your patients.

While chart notes detailing your advice are wise for any patient, documentation is crucial when your patient does not abide by your recommendations. In that case, be sure to note the non-adherence in the medical record. If you have several conversations about the possible consequences of disregarding your plan, dictate a note that includes details of exam findings, discussions, and recommendations. Be sure to include any missed appointments in your documentation. Obtaining an informed refusal will bolster your protection as well.

Patients may have every right to refuse medications or referrals, but you also have the right to discharge non-adherent patients from your practice. Guidelines for dismissing patients can be found in the Physicians Risk Management Reference Manual. You are also encouraged to call the Risk Management Department for telephone advice.

After a Bad Outcome

Dr. Brown is a seasoned obstetrician who was shaken one day by a patient’s unexpected stillbirth. The baby’s death did not reflect badly on Dr. Brown’s care, yet he could not bring himself to approach the patient and her husband afterwards.

That he’d been certain of an easy delivery and had established strong rapport with the parents during their prenatal visits made it that much more painful to talk with them about the tragedy. Instead he had a colleague explain the outcome, imaging that he was the last person they wanted to see during their grief.

Avoiding the parents was Dr. Brown’s only mistake. They sued out of desperation to learn the truth, having assumed that their baby’s death was the result of a cover-up.

At about the same time, Dr. Jordan was called to the hospital in the middle of the night to deal with a difficult labor. After 20 minutes of struggle with a shoulder dystocia, he delivered the baby with a brachial plexus injury.

Dr. Jordan arranged for a private room in which he met with the patient and her partner, as well as his nurse, with whom the parents had established a close relationship throughout the pregnancy. Both the doctor and the nurse turned their cell phones off before entering the room. Meeting the gaze of both parents, Dr. Jordan congratulated them on their new baby boy, and then apologized for the unexpected problem during delivery. “Your baby was larger than I had anticipated,” he began, and then went on to review the maneuvers used during delivery, the extent of the injury, and what would be done to resolve it. He told them that he and his nurse would remain available to them on an ongoing basis for any questions that arose. Then he sat quietly as the two parents absorbed this information.

The father of the injured baby responded angrily. “You should have been able to predict and prevent this!”

Dr. Jordan acknowledged the father’s anger with steady eye contact while he and his nurse continued to sit quietly. When tears began to fall onto the blanket where the mother sat in bed, Dr.
Jordan offered a box of tissues. After the initial emotions played out, the doctor again acknowledged their pain by saying, “We understand that this news is unexpected and difficult for you, and that you want to know what might have been done to prevent your baby’s injury.” Then the nurse explained the risk factors for a shoulder dystocia, and Dr. Jordan admitted that because the mother was at low risk he didn’t discuss with them the possible emergency procedures beforehand. “Do either of you have any questions at this point?” he asked.

The father took the mother’s hand while they consulted each other silently. “Not right now, doctor,” the mother said. “We do appreciate your talking with us, but we’re overwhelmed at the moment.”

Dr. Jordan handed her his card and invited them to call if questions arose later. He went on to reiterate the treatment plan and gave them some written material about brachial plexus injury, including a reputable Web site through which they could obtain further information. Finally, he ended by saying that he would check in with them the same time tomorrow—and that it would be an honor for him to continue as their physician if they chose to stay with him.

Talking with patients and their families about sad news is for most physicians the most difficult aspect of communication. At the same time, the manner in which physicians approach patients about painful topics makes the biggest difference in whether or not the patients pursue a claim. In fact, the majority of claims are filed in an effort to force open and honest discussion, since patients or their families often feel that doing so is the only way they will discover the facts related to an injury or death. In the scenario above, Dr. Jordan’s patient did not pursue a lawsuit and, in fact, did choose to keep him as their doctor. Of the following guidelines for delivering bad news, note those that Dr. Jordan followed:

◆ Hold the meeting in a private room, arrange the furniture beforehand, and have a box of tissues convenient to the patient.
◆ Turn off your cell phone. Ensure that the meeting isn’t rushed.
◆ Be sure that the staff member who knows the patient best is present during the meeting.
◆ Invite the patient to have a family member or friend present.
◆ Explain what happened.
◆ Use nonmedical terms.
◆ Let the patient express strong emotion.
◆ Show empathy both verbally and nonverbally.
◆ Check for understanding.
◆ Provide written materials, referrals, community resources, and follow-up consultation.
◆ Express hope. Even in the case of death, hope can be conveyed in terms of eliminating discomfort.
◆ Discuss your plan for future treatment.
◆ Document your objective description of the meeting, to include:
  - Participant names
  - Discussion content
  - Recommendations
  - Action plan
  - Questions answered
  - Name of contact for any follow-up questions
◆ Arrange for a follow-up visit to establish that the patient retained important information.
◆ Be aware of any stress that might carry over into the next patient visit.
◆ If dealing with a patient from a culture with which you’re unfamiliar, consider consulting with the interpreter or a cultural broker employed by the hospital.
◆ Contact the facility risk manager and the Risk Management Department at Physicians Insurance for assistance.

Talking with patients and their families about sad news is for most physicians the most difficult aspect of communication. At the same time, the manner in which physicians approach patients about painful topics makes the biggest difference in whether or not the patients pursue a claim. In fact, the majority of claims are filed in an effort to force open and honest discussion, since patients or their families often feel that doing so is the only way they will discover the facts related to an injury or death. In the scenario above, Dr. Jordan’s patient did not pursue a lawsuit and, in fact, did choose to keep him as their doctor. Of the following guidelines for delivering bad news, note those that Dr. Jordan followed:
Further information on documentation and communication skills is available in the *Physicians Risk Management Manual*. The Risk Management Department also offers telephone consultation at no charge to members, as well as professional support on an individual basis for physicians encountering a difficult situation.
Preterm Labor

**Background**

Despite recent technologic advances in obstetrical and neonatal care, the incidence of preterm birth has remained constant. Approximately 10–12% of infants are born prematurely (<37 completed weeks). Approximately 1% are very low birth weight (<1500 g). While birth weight-specific perinatal and neonatal mortality has declined, an infant with a very low birth weight is still much more likely to experience perinatal mortality or be neurologically impaired than those weighing ≥2500 g.

**Etiology and Epidemiology**

**Historical factors**

Certain epidemiologic and pregnancy characteristics have been associated with an increased risk for preterm delivery, including:

- Low socioeconomic status
- Nonwhite race
- Maternal age <18 or >40 years
- Previous 2nd-trimester loss
- Chemical dependency on cocaine or tobacco
- Multiparity
- Previous premature delivery (A woman with one previous preterm birth has a 15% recurrence risk for preterm delivery in a subsequent pregnancy. With two previous preterm births, the recurrence risk is 40%).

**Reproductive-tract abnormalities**

Congenital uterine malformations, such as bicornuate or unicornuate uterus, and in some instances, uterine myomata—especially submucosal—may increase the risk for preterm delivery.

Cervical incompetence may also predispose to premature labor and may be either:

- Congenital, as in association with uterine malformation, or
- As a result of a maternal in utero teratogen exposure from diethylstilbestrol, or
- Acquired from previous obstetrical trauma or conization of the cervix.

A **dynamic cervix** has been described as a predisposing risk for preterm delivery. (**Dynamic cervix** is a diagnosis describing dilation of the internal os and funneling of the lower uterine segment and membranes into the cervical canal. The diagnosis is best made in the second trimester by either a transabdominal or transvaginal ultrasound.)

**Infectious etiologies and abnormal serum markers**

Risk factors for preterm delivery also include infectious factors. Very early labor (prior to 28 weeks) is more likely the result of infection than labor occurring after 28 weeks. In one study, 83% of preterm labor of less than 28 weeks had chorioamnionitis. Patients with bacterial vaginosis are also at higher risk. The odds ratio for preterm birth in association with bacterial vaginosis in most studies ranges from 1.5 to 3.0. In high-risk patients with bacterial vaginosis, one study showed a decreased incidence of preterm labor with prophylactic metronidazole and ampicillin. Broad-spectrum antibiotics administered after premature rupture of membranes have also been shown to improve outcomes for the neonate.

**Prevention**

Because the prevalence of preterm delivery has not decreased, it is safe to say that an effective prevention program has not been established. According to studies, pregnancy risk-scoring systems, bed rest, home uterine-activity monitoring, and routine cervical examinations have not conclusively shown benefits. Additionally, the efficacy, timing, and duration of administration of antibiotics have yet to be determined. Of all preventive measures, early
access to prenatal care and frequent medical and nurse contact—along with active patient education—appear to be the best approach.

**Diagnosis**

The signs and symptoms of preterm labor may be subtle, including:

- Uterine contractions or menstrual-like cramps
- The feeling of pelvic pressure
- Increase in vaginal discharge
- Diarrhea

While the above symptoms frequently occur in the absence of preterm labor, patients with these complaints should warrant prompt evaluation. There is no question that preterm labor is over-diagnosed, most commonly in the presence of uterine contractions without cervical change.

**Uterine contractions in the presence of significant cervical effacement of ≥75%, cervical dilation ≥2 cm, and low presenting part or ballooning of the lower uterine segment are associated with a high risk for preterm delivery and should be treated aggressively.**

Fetal fibronectin, a basement membrane protein produced by the placenta and membranes, is a predictor of the likelihood of preterm birth. Its presence in cervical mucus at 24 weeks led to a 60-fold increase in delivery prior to 28 weeks. If negative with preterm contractions, there is less than a 1% chance of delivery within 2 weeks. A rapid screening assay for its detection is now available.

**Management**

Patients with complaints consistent with preterm labor should be promptly evaluated, including evaluation of the cervix, initially with speculum if there is concern about premature rupture of membranes.

*If premature rupture of the membranes has occurred, digital examination of the cervix should **NOT** be done unless the patient is actively laboring, since the risk for infection is significantly increased.*

Initial therapy for preterm labor usually consists of IV hydration and evaluation for urinary tract infection; however, IV hydration has NO established benefit, and excessive hydration is best avoided.

After a diagnosis of premature labor has been made, consider the following issues:

- **Tocolysis**
  
  Available data suggest that tocolysis is effective in most cases for 48–72 hours. Commonly used agents include:
  - Magnesium sulfate
  - Beta-adrenergic agents (terbutaline, ritodrine)
  - Nonsteroidal anti-inflammatory drugs (indomethacin)
  - Calcium channel blockers (nifedipine)

  Contraindications to tocolysis for preterm labor are listed in Table I.

- **Group B streptococcus prophylaxis**

  Preterm infants are especially prone to neonatal GBS infection. Cultures from the introitus and anus area should be sent for GBS culture. In the meantime, treat the patient with IV antibiotics until the results return. Acceptable coverage would include penicillin G, ampicillin, cephalosporins, or vancomycin.
Fetal-lung maturity assessment
Amniocentesis may play a role in evaluating patients in preterm labor. A sample of amniotic fluid may be sent for fetal pulmonary testing, including fluorescent polarization, which is commonly used in the Seattle area, with results available within two hours. The L/S ratio is an acceptable alternative. Since perinatal morbidity and mortality are closely linked to pulmonary status, knowing the fetal pulmonary maturity status may be helpful in guiding therapy with glucocorticoids and determining place of delivery. In addition, amniotic fluid may be sent for gram stain and culture and amniotic fluid glucose assessment, since as many as 15% of patients with idiopathic preterm labor may have infection as an underlying cause. Amniotic fluid containing white cells, bacteria, or a low glucose level has a high association with chorioamnionitis. In this situation, labor may not be postponed, and should be treated aggressively with antibiotics and delivery.

Glucocorticoid treatment
A recent consensus conference on antenatal glucocorticoids concluded that antenatal treatment is effective in reducing the incidence of hyaline membrane disease in preterm deliveries and was significantly underutilized. If fetal pulmonary testing is performed and the fluorescent polarization is >270 or the L/S ratio is <2, glucocorticoids should be administered. Although tocolytics are not likely to be effective for more than 48–72 hours, their administration may stave off delivery long enough to allow for the beneficial effects of glucocorticoids. Acceptable dosing includes betamethasone (one dose, 12 mg IM, followed by a second dose 24 hours later) or dexamethasone (6mg IV q 6h X 4). Glucocorticoids may be used with ruptured membranes, but in these cases, amniocentesis may be performed prior to administration, if possible, to rule out amniotic fluid infection. In pregnancies of ≤30 weeks' gestation, only 10% will have mature fetal lungs. At 32 weeks, 25–30% will have reached pulmonary maturity, and 95% will have mature lungs at 36 weeks. The benefits of glucocorticoid administration after 34 weeks of gestation have not been established.

Maternal transport
Survival rates for preterm/very low birth weight infants and premature infants with pulmonary immaturity are higher in Level III centers than those born in Level I and II facilities. If time is available for safe maternal transport in these cases, such transport should be strongly considered. Each hospital, in conjunction with obstetric, pediatric, and neonatal consultation, should develop guidelines for maternal and neonatal transport.

Continued tocolysis
After initial evaluation and a decision made to transport or keep a mother, tocolysis usually should be continued for a minimum of 48 hours. Tocolytic drugs may have major side effects to mother and fetus and should be administered only under careful supervision. The goal of tocolysis is to minimize uterine contractions with the least amount of drug possible. Potential complications of tocolytic agents are listed in Table II. The best outcomes result from a carefully constructed protocol for tocolysis. Each hospital, in conjunction with obstetric, neonatal, and pediatric staff, should develop a protocol for evaluation of preterm labor and safe administration of tocolytic agents.

Consultation
As with any complicated case, consultation with obstetric, pediatric, neonatal, or perinatal colleagues should be encouraged.
◆ Risk management implications

Maintain a high index of suspicion for the patient with a previous history of preterm birth, as well as for the patient who reports subtle changes (e.g., cramps, backache, increased discharge). These patients need to be seen frequently and monitored carefully with screening for infection, cervical changes, and fetal fibronectin.

For those patients that deliver prematurely, ALL involved parties should be informed in anticipation, including neonatology and anesthesia. If possible, these babies should be transferred in utero to a Level III facility.

It is important to obtain the appropriate cultures from cervix and amniotic fluid and to send the placenta for pathological examination to document the presence of chorioamnionitis.

References


Table I

Contraindications To Tocolysis For Preterm Labor*

General Contraindications

- Acute fetal distress (except intrauterine resuscitation)
- Chorioamnionitis
- Eclampsia or severe preeclampsia
- Fetal demise (singleton)
- Fetal maturity
- Maternal hemodynamic instability

Contraindications for Specific Tocolytic Agents

Beta-mimetic Agents

- Maternal cardiac rhythm disturbance or other cardiac disease
- Poorly controlled diabetes, thyrotoxicosis, or hypertension

Magnesium Sulfate

- Hypocalcemia
- Myasthenia gravis
- Renal failure

Indomethacin

- Asthma
- Coronary artery failure
- Gastrointestinal bleeding (active or past history)
- Oligohydramnios
- Renal failure
- Suspected fetal cardiac or renal anomaly

Nifedipine

- Maternal liver disease

* Relative and absolute contraindications to tocolysis based on clinical circumstances should take into account the risks of continuing the pregnancy versus those of delivery.

### TABLE II

**Potential Complications Of Tocolytic Agents**

#### Beta-Adrenergic Agents
- Hyperglycemia
- Hypokalemia
- Hypotension
- Pulmonary edema
- Cardiac insufficiency
- Arrhythmias
- Myocardial ischemia
- Maternal death

#### Magnesium Sulfate
- Pulmonary edema
- Respiratory depression*
- Cardiac arrest*
- Maternal tetany*
- Profound muscular paralysis*
- Profound hypotension*

#### Indomethacin
- Hepatitis‡
- Renal failure‡
- Gastrointestinal bleeding‡

#### Nifedipine
- Transient hypotension

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* Effect is rare; seen with toxic levels.
‡ Effect is rare; associated with chronic use.

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Fetal Monitoring

Initially, the fetal monitor was developed for the intrapartum period to better evaluate the status of the fetus during labor. Earlier identification of pending acidosis and hypoxia would alert the obstetric team, leading to more timely intervention and thus a significant reduction in the incidence of neonatal morbidity and mortality. Though clinical trials have failed to demonstrate a significant impact on morbidity and mortality, fetal monitoring is now essentially universal.

It later became apparent that the monitor could be used to evaluate the antepartum status of the fetus as well. Antepartum fetal surveillance for a variety of conditions such as postdatism and suspected intrauterine-growth retardation has also become a mainstay in the management of pregnancy.

Antepartum Fetal Surveillance

Initial monitoring can be carried out by the patient at home. Because normal fetal activity is indicative of its well-being, providers should instruct their patients to begin routinely noting “kick counts” during the last few weeks of pregnancy. Various strategies can be effective. One example, called the “count of 10,” involves asking the mother to count ten movements in the course of her normal activities and to report to the physician if there are fewer than 10 movements by mid-afternoon. Another is to ask the mother to lie on her side and consciously count, reporting if there are fewer than 3–4 per hour. The importance is not the methodology but the recruitment of the patient as the observer.

Regardless of the technique, the goal is for mothers to report any significant change in fetal movement. Absence of fetal movement should prompt a call to the physician for further evaluation.

Commonly used tests include:

Nonstress Test (NST)
- Based on the response of the fetal heart rate to fetal movement
- Performed with the patient in lateral semi-Fowler position
- Fetal heart rate monitored with ultrasound transducer
- Normal (Reactive): two or more fetal heart rate accelerations of 15 bpm above baseline within a 20-minute period
- Nonreactive: lack of accelerations. Consider proceeding with CST or Biophysical Profile to further evaluate fetal status

Contraction Stress Test (CST)
- Based on the response of the fetal heart rate to uterine contractions
- Performed with the patient in lateral semi-Fowler position
- Fetal heart rate obtained by an ultrasound transducer
- Contraction activity monitored with a tocodynamometer
- Contraction induced by nipple stimulation or intravenous administration of oxytocin
- Objective is to achieve 3 contractions of at least 40 seconds’ duration within 10 minutes
- Results categorized as follows:
  - Negative—no decelerations
  - Positive—late decelerations following 50% or more contractions even if the contraction frequency is less than 3 in 10 minutes
  - Suspicious (equivocal)—occasional late or significant variable decelerations
  - Unsatisfactory—fewer than 3 contractions in 10 minutes
Contraindicated in pregnancies with threatened preterm labor, at high risk for preterm labor, with placenta previa, or with a classic uterine scar.

Biophysical Profile (BPP)

Five components:

a. Reactive NST

b. Fetal breathing movements (1 or more episodes of rhythmic fetal breathing movements of 30 seconds or more within 30 minutes)

c. Fetal movement (3 or more distinct body or limb movements within 30 minutes)

d. Fetal tone (1 or more episodes of extension of a fetal extremity with return to flexion)

e. Amniotic fluid volume: a single vertical pocket of amniotic fluid exceeding 2 cm is considered evidence of adequate fluid

Interpretation:

a. A score of either 0 or 2 assigned to each of the 5 observations.

b. A score of 8–10 is considered normal.

c. A score of 6 is considered equivocal (fetus should be retested in 12–24 hours).

d. A score of 4 or less is considered abnormal.

e. If oligohydramnios is present, further evaluation is warranted.

Modified BPP:

a. Includes a reactive NST and a normal amniotic fluid index

b. Alternative to BPP with comparable predictive value

Ultrasound

In situations with a high index of suspicion for fetal compromise, growth parameters should be evaluated for consideration of uterine growth restriction.

Umbilical artery Doppler measurements reflect a placental resistance to blood flow, and may predict impending fetal distress.

Indications for antepartum testing include but are not limited to:

- Postdates (41–42 weeks)
- Decreased fetal movement
- Diabetes
- Maternal disease (cardiac, renal, pulmonary, neurologic, etc.)
- Hypertensive disorders (chronic or pregnancy-induced)
- Intrauterine growth restriction
- Maternal substance abuse
- Fetal isoimmunization
- Polyhydramnios
- Oligohydramnios
- Previous unexplained fetal demise
- Multiple pregnancy

Intrapartum Monitoring

Several studies suggest that monitoring by periodic auscultation is as effective as continuous electronic monitoring, with outcomes that are not significantly different. Although not considered standard, continuous monitoring for all laboring patients has become commonplace. It is considered standard, however, to continuously monitor all high-risk obstetric patients. We have seen some situations where the monitor was removed in preparation for cesarean section. It is imperative that the monitor...
continuously record until the infant is delivered—even when cesarean section is required.

High-risk conditions which are indications for continuous electronic fetal heart rate monitoring include but are not limited to:

- Age >35 or <16
- Diabetes
- Hypertension
- Maternal disease (cardiac, pulmonary, renal, neurologic)
- Previous cesarean section
- Previous abruption
- Previous stillbirth
- Parity greater than five
- Substance abuse
- Dysfunctional labor
- Intrauterine growth restriction
- Polyhydramnios, oligohydramnios
- Vaginal bleeding
- Induction of labor
- Premature labor
- Premature rupture of membranes
- Multiple pregnancy
- Meconium-stained fluid
- Gestational age <37 or >42 weeks
- Estimated fetal weight <2500 g or >4000 g
- Prolonged labor
- Maternal temp >100°F
- Abnormal presentation (e.g., breech, face)
- Isoimmunization

Medicolegal Implications

In those unfortunate situations where the outcome is suboptimal, the monitor tracing is almost always a major source of interest. Its record of the course of intrapartum events may be helpful in defending the provider’s care. It may also be the plaintiff attorney’s best piece of evidence to prove an obstetric care team’s negligence.

Ironically, the tracing itself is frequently in dispute. Review of our claims files suggests that monitoring is far from an exact science. National experts have given contradictory opinions on the same tracing. In one situation, the jury was so confused by the expert testimony from both sides that the ultimate decision for the defense was reached independently of the monitor findings. Instead, the jury reasoned that the mother’s history of smoking had been the causative factor.

While monitoring can be ambiguous, certain persistent patterns on a tracing require a response on the part of the practitioner. These include but are not limited to:

- Severe variable decelerations
- Persistent late decelerations with a nonreactive tracing
- Persistent fetal tachycardia with a nonreactive tracing
- Prolonged bradycardia

Failure to execute an intervention or form a plan in these situations may make it difficult to defend against a malpractice allegation.

Despite differences of interpretive opinion, the electronic fetal monitor is a significant element in the current practice of obstetrics. We recommend, therefore, that all labor and delivery suites have specific monitoring policies to help eliminate the monitor as a potential problem in the defense of a malpractice claim.

Monitoring policies should cover the following:

- Patients being observed in labor and delivery suite for any reason (e.g., labor check, non-stress testing, post-amniocentesis, prior to
elective repeat cesarean section, threatened preterm labor, acute illness or trauma, vaginal bleeding)

a. Monitor fetal heart rate and uterine activity for a minimum of 30 minutes.
b. Discontinue monitoring only if the monitor strip is reassuring (stable heart rate of 120-160 with accelerations or adequate variability and no decelerations). Tracings should be reviewed by an OB provider within 24 hours of their completion.

c. If intermittent, run monitor strips for 20 minutes each hour.
d. Abnormal changes or risk situations require continuous monitoring.
e. Mode of monitoring
   1. In high-risk situations, and after membranes are ruptured, the internal fetal electrode is preferred.
   2. Internal monitoring should always be utilized if:
      i. There is difficulty obtaining an adequate tracing
      ii. There is decreased variability
         (Apart from HIV, hepatitis, or active herpetic infections, there are no contraindications to internal monitoring. External monitoring may be adequate in these situations.)

f. Auscultation: if used alone, discuss limitations with the patient and her partner.
   Auscultation for 60 seconds during and immediately following a contraction should be carried out at the following intervals:
   Every 30 minutes in early labor
   Every 15 minutes in active labor
   Every 5 minutes during second stage

g. In the case of a nonreactive or suspicious tracing, fetal scalp stimulation can reduce the false-positive rate of the monitoring test. An acceleration in response to scalp stimulation is reassuring in the short-term (i.e., 30 minutes) and allows for further observation.

Further recommendations:
◆ Develop a departmental conference for the obstetrical team to review monitor tracings on a regular basis.
◆ Require medical and nursing staff to attend courses in fetal monitoring.
◆ Optimize the lines of communication between all members of the team.
◆ During the entire course of active labor, make regular and timely entries in the progress notes to clarify your interpretation of fetal condition and to document caregivers’ thoughts.
◆ Note on tracing when medications are given, vaginal exams are done, physician present, etc.
◆ Consult liberally whenever a question is raised about the best course of action, or if the findings are not reassuring.
◆ If the patient refuses use of the monitor, document your informed-consent discussion.
Given the current statute of limitations, store the tracings for 26 years. For added protection, individual practitioners may want to make personal office copies for safekeeping of files documenting bad outcomes. Be sure to copy thermal paper tracings onto standard paper.

Computer disks are an acceptable alternative if they do not permit overwriting or revision.

References


Pregnancy-Induced Hypertension

The purpose of including a chapter on hypertensive disorders in pregnancy is not to restate the well-known nature of this entity, but to increase awareness of potential trouble and discuss some of the related risk-management subtleties. The most common malpractice cases involve instances of:

- Missed diagnosis
- Lack of appreciation for potential severity
- Communication failure between patient and provider
- Presentation so atypical that proper management was never considered

The perplexing aspects of pregnancy-induced hypertension are the variety of presentations and the unpredictability of the clinical course, combined with the potential for adverse outcome. Elevated blood pressure (defined as a sustained blood pressure increase to levels of 140 mm Hg systolic or 90 mm Hg diastolic) may or may not be present in association with abnormalities of renal, hepatic, coagulation, cardiac, or CNS functioning. In addition, each of these findings may occur in combination with one another or present as the sole symptom. Accordingly, the range of presentations varies from the common to the extremely bizarre. For example, we are aware of a patient who was normotensive at 23 weeks with 4+ proteinuria and who precipitously (within 24 hours) proceeded to hepatic rupture and death. Such cases raise the suspicion for other underlying and complicating disease processes such as acute glomerulonephritis, lupus nephritis, or one of the other collagen vascular diseases.

Fortunately, the vast majority of patients have minimal elevations in blood pressure, perhaps accompanied by mild proteinuria. They can be managed as outpatients and proceed to have uneventful deliveries. Therefore, providers can easily become complacent or cavalier when confronted with minimal findings. The following two cases from our files illustrate the need for caution even in the seemingly straightforward preeclamptic.

Case #1

A 19-year-old GIPO was seen for a regular prenatal visit at 41+ weeks on a Friday afternoon with BP of 130/90 and 120/85 (ten minutes later) and trace of proteinuria. She was scheduled for induction on Monday morning if labor had not ensued spontaneously. Earlier prenatal BP measurements had been in the range of 110–120/70–80. On Saturday the patient called her mother to report that the baby was not moving very much. She did not, however, report this to her physician. On Monday morning she was admitted with BP of 140/90, 2+ proteinuria, and absent fetal heart tones. Fetal demise was confirmed by ultrasound, and after a 20-hour labor, a 9-pound stillborn male was delivered by cesarean section for cephalopelvic disproportion. Support for the clinical management could not be found since no fetal surveillance studies (specifically NST) were performed. The case was ultimately settled for $50,000.

Case #2

A 26-year-old GIPO who had been normotensive throughout pregnancy was seen at 38 weeks for a routine prenatal visit with BP of 130/90 and 2+ proteinuria. She was admitted to the hospital antepartum ward in preparation for induction the following morning. A mild sedative was given for sleep. The following morning, when the fetal monitor was applied, fetal heart tones were absent. Fetal demise was confirmed by ultrasound and an 8-hour labor was productive of a 7-pound stillborn male. As in case #1, the liability problems could not be overcome and the case was settled out of court.
Both of these cases are marked by the low index of suspicion for the ultimate outcome. A more attentive and aggressive management by the provider in case #1 and by both provider and staff in case #2 would likely have prevented the adverse outcome. In both situations the simple performance of a reactive NST would have made these cases defensible. If the NST had been nonreactive, more aggressive intervention would have undoubtedly taken place. Other tools available for assessing fetal status, such as stress testing, amniotic fluid index, and the biophysical profile, might have followed a nonreactive NST.

**Recommendations**

**Prenatal Screening**

Measure and record each gravida’s weight, blood pressure, and urinary protein at each prenatal visit. Occasionally, the urinalysis may not be documented because of collection problems.

*Proteinuria is the most reliable and definitive diagnostic sign of the disease. If present, regardless of the blood pressure, a 24-hour measurement is important to evaluate the severity of the process.*

A confirmed dipstick value of 1+ or greater is significant. A value of 1+ protein should cause suspicion for preeclampsia, if not infection. A pregnant woman should not excrete more than 350 mg of protein in 24 hours.

**Evaluation**

Admission to the hospital for an initial period of observation and a comprehensive workup is recommended to fully evaluate maternal and fetal well-being. Initial lab should include:

- Urinalysis
- CBC

Follow-up should include:

- Daily weight
- Fluid intake/output
- Urine dipstick for protein
- Blood pressure four times daily
- Platelet count
- Liver function weekly
- Weekly or twice-weekly NST
- Weekly or twice-weekly biophysical profile for patients who remain undelivered

Specific criteria for monitoring the outpatient should be adopted and fully documented. These guidelines might include but not necessarily be limited to:

- A stable blood pressure not greater than 140/90
- Urine protein <350 mg per day
- Normal stable platelet count
- Normal liver function, e.g., ALT, AST
- Immature fetus with reactive NST
- Normal amniotic fluid volume
- Compliant patient who can remain at bed rest
- Available transportation
Consultation/Referral

While it may not always be necessary in the milder cases, another opinion and consultation with a maternal-fetal specialist—if only by phone—demonstrates a thorough management process. Referral to a subspecialist should be strongly considered in high-risk situations which include:

- Blood pressure >160 systolic or >100 diastolic
- Urine protein >5 g per 24 hours
- Oliguria (<30 cm³/hour x 6 hours)
- Abdominal pain suggesting liver involvement
- Visual disturbances
- HELLP syndrome (Hemolysis, Elevated Liver enzymes, Low Platelets)
- Intrauterine growth restriction
- Oligohydramnios
- Fetal status that is not reassuring by biophysical profile testing

Management

If the fetus is mature (>37 weeks or by fetal lung maturity testing for those between 34 and 37 weeks), it is usually prudent to proceed to delivery. Those that are not mature and need to be delivered for either maternal or fetal indications should be referred to a tertiary center. During labor, continual fetal monitoring is indicated. Magnesium sulphate is the drug of choice—it is extremely safe and should be used without hesitation for seizure prophylaxis. Apresoline or another antihypertensive may be used in situations where blood pressure is not well controlled, but it must be monitored carefully due to the potential for an unpredictable and sudden hypotensive response. These patients also need to be monitored in the postpartum period, and it is important to remember that preeclampsia and eclampsia may occur initially in the postpartum period. Be sure to evaluate the patient who complains of first-time headache or abdominal pain after delivery.

Education and Informed Consent

Keep the patient and appropriate family fully informed of the reasons for performing each element of the evaluation. Outpatients should be instructed to immediately report changes such as:

- Severe headache
- Abdominal pain
- Persistent nausea and vomiting
- Visual disturbances
- Decreased fetal movement
- Cramping
- Leaking of fluid or vaginal bleeding
- Unusually rapid swelling or weight gain

Document discussions with the patient and family with a comprehensive note in the chart that includes the benefits and risks of each management decision.

Communication

Since it is possible that a number of providers may be responsible for managing the patient at any given time, it is important that records be immediately available. It is essential that patients understand the importance of telling staff and providers unfamiliar with the case exactly what has transpired in the prenatal course and why added precaution has been recommended.
Key Points

Always keep in mind the following risk management principles. Their application provides the basis for quality patient care and the avoidance of adverse outcomes.

◆ A heightened awareness for potential problems
◆ A high index of suspicion for trouble
◆ Attention to detail
◆ Prompt evaluation
◆ Early intervention
◆ Careful monitoring
◆ Liberal consultation with colleagues
◆ Documentation with a defensible management plan
◆ Communication with all involved parties
◆ Patient education and informed consent
Prevention of Perinatal Group B Beta Strep

Background

Over the past several decades, Group B Streptococcus (GBS) has been implicated as a leading cause of serious perinatal infection. Yearly, more than 10,000 neonates in the U.S. are affected with a manifestation of GBS-associated morbidity, such as sepsis, pneumonia, or meningitis. In 1990, neonatal mortality in the U.S. was about 1.8 per 1,000, amounting to approximately 7,600 deaths. Neonatal complications of GBS can be categorized as early neonatal infection (i.e., occurring within 7 days of delivery) or late (more than 7 days after delivery). Manifestations of maternal morbidity include urinary tract infection, amnionitis, endometritis, and wound infection.

Neonatal complications remain the major concern of perinatal GBS infection. Although the timely use of intrapartum antibiotics significantly reduces the incidence of both early onset neonatal sepsis and neonatal colonization, it does not necessarily prevent late onset neonatal sepsis.

Approximately 30% of women are colonized with GBS. In uncomplicated pregnancies, GBS neonatal sepsis occurs at a rate of 1 per 1000. This rate increases dramatically, however, in the premature infant (i.e., less than 37 weeks’ gestational age). Perinatal management has concentrated on identifying the at-risk individuals and developing proper treatments to reduce both maternal and neonatal complications. In 1996, ACOG, AAP, and the CDC collaborated in the development of treatment strategies based on either antepartum culture identification or risk status. More recent evidence has revealed that approximately 40% of neonatal sepsis occurs in the low-risk group, which is therefore not identified by a risk-based prevention strategy. Accordingly, CDC guidelines released in 2001 recommend screening ALL patients with cultures at 35–37 weeks. Culture-positive patients, and those with high-risk characteristics, should be given intrapartum prophylactic antibiotics. High-risk characteristics include:

- Premature infant (<37 weeks)
- Mothers with prolonged rupture of membranes (for example, PROM >18 hours prior to delivery)
- Maternal fever of >100.4°F (or >38°C)
- Clinical suspicion for amnionitis
- Mothers with a genetically inherited inability to develop antibodies against the capsid of the GBS bacterium. Because of this possibility, mothers who have previously delivered GBS-affected neonates have a much higher chance of delivering a similarly affected infant.

Because GBS primarily colonizes in the bowel, complete eradication is highly unlikely, and contamination from the bowel to the genitourinary system is common. For most women, the only symptom of GBS colonization is urinary tract infection; such infections tend to be found in patients with high colony counts of GBS as well as in patients with compromised GBS immunity. However, identification is difficult because, as Boyer’s work in 1986 revealed, the degree of vaginal colonization can vary. A negative first-trimester culture (which has an approximately 30% sensitivity) does not necessarily rule out significant GBS colonization at term. At present, a culture obtained in the last six weeks of pregnancy has a greater than 90% sensitivity and is the best indicator of GBS colonization. Cervical cultures, however, have the lowest sensitivity. Swabs should be taken from the outer third of the vagina and from the perianal area, and then plated on selective broth/media (Todd-Hewitt) to maximize the sensitivity of the GBS culture.

Vaginal GBS colonization can be reduced transiently with IV antibiotics, but because eradication of the bacterium from the bowel is unlikely, the
chances are high for recolonization of the vaginal area. Thus, reduction of the colonization in the antepartum period may not persist to term. When administered at least four hours prior to delivery, IV antibiotic prophylaxis has been found to dramatically reduce neonatal colonization and sepsis. This treatment appears to allow enough time to reduce the colony counts in the vaginal area and provide adequate therapeutic antibiotic levels in fetal blood. If delivery occurs sooner than four hours, antibiotics should be offered because they reduce neonatal colonization and sepsis.

Because GBS is highly sensitive to penicillin and there is minimal risk of developing resistant strains, penicillin is the drug of choice. Ampicillin is an acceptable alternative for GBS but carries a greater risk for the development of resistant strains of other bacteria. Patients in labor who have signs of amnionitis should receive a broad-spectrum antibiotic in addition to penicillin because of the multi-bacterial nature of this infection.

Penicillin-allergic patients should be treated with either vancomycin or a cephalosporin. Clindamycin and erythromycin are considered less likely to be effective because of the higher incidence of resistant strains.

**Strategies**

We recommend that the practicing clinician use the culture-based strategy to reduce perinatal GBS transmission and perinatal morbidity/mortality. Modification of this protocol is reasonable, provided the basic premises are followed.

The CDC culture-based strategy is portrayed in Fig. 1.

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**Antibiotic Recommendations**

- Penicillin G 5 mU IV load, then 2.5 mU IV every 4 hours until delivery
  
  Alternatives:
  - Ampicillin 2 g IV load, then 1 g IV every 4 hours until delivery
  - Cefazolin 2 g IV load, then 1 g IV until delivery
  - Vancomycin 500 mg IV every 6 hours in patients with normal renal function

**Risk Management Recommendations**

- Make sure antibiotics are available on the labor and delivery suite for rapid administration to ensure the appropriate treatment of patients prior to delivery.
- Start antibiotics as soon as possible in patients requiring prophylaxis.
- Have the results of the outpatient cultures readily available to the delivering physician.
- Obtain cultures for GBS at 35–37 weeks’ gestation from the outer vaginal/perianal region and plate on selective media to maximize sensitivity.
- Encourage the use of penicillin instead of broad-spectrum antibiotics for GBS prophylaxis, if GBS-susceptible and not penicillin-allergic.
- Have a written protocol for implementation of these strategies on the labor and delivery suite.

**References**


If onset of labor or rupture of amniotic membranes occurs at <37 weeks of gestation and there is a significant risk for preterm delivery (as assessed by the clinician), follow the suggested algorithm for GBS prophylaxis as indicated by the CDC.

† If amnionitis is suspected, broad-spectrum antibiotic therapy that includes an agent known to be active against GBS should replace GBS prophylaxis.


**Fig. 1.** Indications for intrapartum antibiotic prophylaxis to prevent perinatal group B streptococcal disease under a universal prenatal screening strategy based on combined vaginal and rectal cultures collected at 35–37 weeks of gestation from all pregnant women.


The Neurologically Impaired Neonate

Historically, obstetrics leads other specialties in the total dollars spent in malpractice claims, largely due to the number of impaired neonates in which the enormous expense of long-term care is picked up by the malpractice insurer. A factor in the expense of these cases is the tendency of plaintiff attorneys to exploit misconceptions regarding intrapartum events. For example, the plaintiff’s bar has been able to successfully argue that cerebral palsy is caused by intrapartum events that could have been prevented through effective pre-delivery monitoring and cesarean section. In actuality, studies show that at least 85% of cerebral palsy cases were caused by undetected and untreatable events. An Oxford study puts the figure as high as 88%, reporting that only 12% of cerebral palsy cases related to intrapartum events were potentially preventable. The vast majority of cases were due to antenatal or postnatal causes with no evidence of intrapartum asphyxia.

These cases are hard to defend because the potential causes are infinite, given the multitude of obstetric, genetic, environmental, and infectious etiologic possibilities. Factors that determine the legal outcome of such cases include:

- Jury’s sympathy for the patient’s loss
- Manipulative strategies of plaintiff’s bar
- Credibility of expert witness testimony
- Failure to adhere to a standard of practice, whether or not causative of the child’s impairment

Progress has been made, however, in identifying causes of neonatal neurologic impairment which implicate antepartum rather than intrapartum events. For example, a recent study in San Francisco found an increased association between cerebral palsy and the presence of maternal infection at the time of admission for labor. The use of monitoring techniques, laboratory data, and neuro-imaging studies will help provide ammunition for defending claims without merit.

Clinical And Laboratory Indicators

Careful evaluation and documentation of data is critical during and after delivery of an affected child. While no single indicator can determine the exact time of neurologic damage, a combination of the following indicators, consistent with an undetectable and untreatable antepartum etiology, can provide helpful defense against an unwarranted claim.

Electronic Fetal Monitor

The fetal monitor is one of the best tools for estimating the time of the neurologic injury. A review of continuous monitor tracings started at the time of admission may make it possible to differentiate an antepartum event from an intrapartum event. For example, an initial flat tracing which lacks normal variability would strongly suggest an infant who was compromised at the time of admission or earlier. Conversely, the tracing of an infant with an initially normal baseline and variability which subsequently shows decelerations, decreased variability, tachycardia, and ultimately profound bradycardia would more likely suggest intrapartum asphyxia.

Apgar Score

An Apgar score of less than 3 at 10 minutes has been associated with birth asphyxia, whereas a score above 6 at 10 minutes is less consistent with acute intrapartum asphyxia.

Cord Blood Gases

Cord gases with normal pH, pO₂, pCO₂, and base excess are strong evidence that an acute intrapartum hypoxic event did not occur. An infant with elevated pCO₂ who responds quickly to simple resuscitation efforts also helps to differentiate a benign transient acute respiratory acidosis from a
metabolic acidosis related to a chronic or preexisting condition. For example, a metabolic acidosis with a base excess of –10.0 or greater is more likely to be associated with neurologic injury.

**Hematological Studies**
Recent literature suggests that nucleated red cell, platelet, and white cell counts are useful in differentiating acute hypoxic events from chronic and preexisting ones. For example, recent reports indicate that a preexisting hypoxic event will demonstrate higher nucleated red-cell counts which return to normal more slowly than those measured for an intrapartum event. Controversy exists regarding the validity and significance of these tests in pinpointing the time of neurologic injury. This information may prove valuable to your defense, however, in the event of a future claim.

**Bacterial Cultures**
An expanding body of information suggests that intrauterine exposure to infection endangers the brains of normal-birth weight neonates. In one study, infants born from mothers with infection were ten times more likely to have unexplained cerebral palsy than controls. In the same study, half of the infants whose mothers had infection had five-minute Apgar scores of less than six. Another study reveals that very low birth weights and cerebral palsy were four times more likely to have positive placental cultures for E. coli than those without cerebral palsy. Only one in ten mothers, however, had clinical signs of infection. These two studies confirm the hypothesis that infection-induced elevation of cytokines in fetal brains leads to infant brain damage.

The risk management recommendation is to obtain cultures and placental examination in ALL babies with low Apgar, very low birth weight, and abnormal neurological findings.

**Placenta**
Histological examination of the placenta may reveal etiological clues for unexplained cerebral palsy. For example, placental evidence may provide the only clues for chorioamnionitis related to an antepartum occult infection, and old infarcts would be more suggestive of an antepartum event. Umbilical cord evaluations can also help identify etiologies for a compromised infant such as infection (funisitis) or structural abnormalities (true knots, velamentous cord insertions, vasa previa).

**Encephalopathy**
The acutely asphyxiated neonate usually demonstrates signs of encephalopathy, such as seizure activity or prolonged hypotonia. Neonates will generally exhibit signs of encephalopathy within 24 hours after delivery. This is helpful in signaling the practitioner to carefully review the intrapartum events and make sure all pertinent information is well documented.

**End Organ Damage**
A detailed neonatal exam and laboratory evaluation, particularly of the kidneys and liver, is critical to rule out acute asphyxiation. Intrapartum asphyxial events that lead to neurologic damage will usually include kidney and liver involvement identified in the neonatal period.

**Neuro-Imaging Studies**
Neonatal ultrasound, CAT scan, and MRI findings may be useful for determining the etiology of a neurologic abnormality. For example, intracranial malformations or calcifications would be suggestive of antepartum infection present for at least one week. Periventricular leukomalacia seen on ultrasound suggests an injury at least 48 hours old or greater.

Samples of neonatal meconium for MecStat can assess prenatal drug exposure.
Summary

While none of these indicators alone can determine an absolute time of neurologic injury, taken collectively they can be shown to be more consistent with chronic antepartum events, as opposed to acute intrapartum events. A persuasive causation defense can therefore be provided. The bottom line is that collecting and documenting this information is of utmost importance for defending your management in such unfortunate outcomes.

Risk Management Recommendations

◆ A comprehensive history and physical should be performed at the patient’s initial antepartum visit to adequately assess and accurately document the level of risk. Particular attention should be given to past obstetrical history and any family history of abnormalities, as well as any history of smoking, drug abuse, and medication exposure in the early prenatal period. It is important to notify the patient and discuss concerns about any potential increased risks in pregnancy. All tests, their results, and patient notification/discussion should be documented thoroughly.

◆ Any additional related information learned at subsequent prenatal visits should also be well documented.

◆ Obstetric departments should develop policies and protocols designating specific information to gather and explaining how this information should be stored. At the least, fetal monitor strips should be carefully preserved, cord blood gases obtained, and placentas saved for pathologic evaluation. (When sending the placenta to the pathologist, specify particulars such as maternal fever, R/O amnionitis, etc.)

◆ Sometimes a provider may feel discomfort, fear, or guilt in the event of an adverse outcome. It is precisely at such times, however, that it is imperative that the patient not feel abandoned.

Do not minimize patient contact. Keeping the lines of communication with the patient and family open, making information readily available, and engaging in honest and frank discussions may prevent the kind of anger which leads to litigious action.

◆ Neuro-reconstructive surgery should be considered for Erb’s palsy from shoulder dystocia which does not improve by four weeks of age. Several centers report positive results when this is treated early.

◆ Communication may be facilitated if you let the pediatrician know that you would like follow-up on the infant’s progress. It is particularly important to coordinate information given to the parents by all providers (obstetric, pediatric, neonatal, and nursing staff), as parents will focus on any discrepancies or seeming contradictions.

◆ As soon as neurologic impairment is evident, inform the liability carrier’s claims department for assistance and advice.

Reference

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Neonatal Encephalopathy & Cerebral Palsy

Knowledge about the causes of neonatal encephalopathy and cerebral palsy is rapidly developing. A report published in 2003 by a joint task force of the American College of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics (AAP) shed new light on the cause of neonatal encephalopathy and cerebral palsy.

Previously, evidence of birth asphyxia and hypoxic-ischemic neonatal encephalopathy was based upon four nonspecific clinical signs: (1) meconium-stained amniotic fluid, (2) nonreassuring fetal heart rate patterns, (3) low Apgar scores, and (4) neonatal encephalopathy. The evidence-based findings of the ACOG Task Force demonstrate that these peripartum signs are most often the secondary results of pathologic processes established before labor. New data show that less than a quarter of infants with neonatal encephalopathy show evidence of hypoxia or ischemia at birth. In most cases the events leading to cerebral palsy are caused by numerous and unpreventable factors during fetal development or after delivery. A large proportion of cerebral palsy cases are associated with conditions such as pre-term birth, intrauterine growth restriction, intrauterine infection, coagulation disorders, multiple pregnancies, antepartum hemorrhage, breech presentation, and chromosomal or congenital abnormalities. Physicians should therefore be aware that these four nonspecific signs should no longer be used as the main evidence for a diagnosis of birth asphyxia.

ACOG has issued new criteria to define an acute intrapartum hypoxic event. The nine criteria help to assess the likelihood that the pathology causing the cerebral palsy happened during labor. They focus on the analysis of peripartum blood gases as essential to demonstrate that hypoxia was present around the time of birth. All four of the following essential criteria must be present to define an acute intrapartum hypoxic event sufficient enough to cause cerebral palsy:

1. Evidence of a metabolic acidosis in fetal umbilical cord arterial blood obtained at delivery (pH <7 and base deficit ≥12 mmol/L)
2. Early onset of severe or moderate neonatal encephalopathy in infants born at 34 or more weeks of gestation
3. Cerebral palsy of the spastic quadriplegic or dyskinetic type
4. Exclusion of other identifiable etiologies such as trauma, coagulation disorders, infectious conditions, or genetic disorders

If any one of the four essential criteria is not met, intrapartum hypoxia did not likely cause the cerebral palsy. If all four criteria are met, you must then establish whether the hypoxia is due to long-term hypoxia, or whether hypoxia occurred acutely during labor in a previously healthy fetus. Five criteria are reported to collectively suggest an intrapartum timing (within 48 hours of labor and delivery) but are nonspecific to asphyxial insults. Most or all of these five signs will be present as a group in severe cases of intrapartum hypoxia.

1. A sentinel hypoxic event (e.g., ruptured uterus) occurring immediately before or during labor
2. A sudden and sustained fetal bradycardia or the absence of fetal heart rate variability in the presence of persistent, late, or variable decelerations, after a hypoxic sentinel event when the pattern was previously normal
3. Apgar scores of 0–3 beyond 5 minutes
4. Onset of multisystem involvement within 72 hours of birth
5. Early imaging study showing evidence of acute nonfocal cerebral abnormality
Neonatal Evaluation

Assessing the depressed newborn, especially after an uncomplicated delivery, should include:

1. Consideration of maternal and family medical conditions, such as
   a. Thyroid or other immune disorders
   b. Deep vein and other thrombotic disorders
   c. Intolerance to oral contraceptives
   d. Early stroke or myocardial infarction
   e. History of prior pregnancy loss
      i. Death of twin fetus, even early in the pregnancy?
      ii. Maternal history of chorioamnionitis or sexually transmitted disease?
      iii. Evidence of intrapartum maternal fever?
2. Examination of the umbilical cord, membranes, and placenta
3. Immediate laboratory studies
   a. Examination of the placenta, cord, and membranes
   b. Cord gases
   c. Placental cultures
   d. Maternal and/or fetal blood cultures
4. Later laboratory studies
   a. Imaging studies
   b. Liver function tests and renal function tests
   c. In the event of signs of thrombosis or stroke, examine indicators of thrombophilia
   d. Consider submitting placenta for formal pathologic investigation

Conclusion

Much remains to be learned about the causes and prevention of cerebral palsy. The 2003 ACOG/AAP report reveals new information that might alleviate undue blame on physicians for cerebral palsy, especially when labor management was not ideal. Further research into the causes of neonatal encephalopathy and cerebral palsy will hopefully lead to interventions that will reduce the incidence of these conditions.

Key Points

Physicians are strongly advised to:

♦ Document whether or not the four criteria exist that define an acute intrapartum hypoxic event for all newborns who may have or develop neonatal encephalopathy or cerebral palsy. The documentation should be done as close as possible to the time of delivery.

♦ Document whether or not the five criteria exist which suggest an intrapartum timing but are nonspecific to asphyxial insults.

♦ Unless you have determined so from the above-mentioned criteria, refrain from using terms such as “newborn asphyxia,” “birth trauma,” or “hypoxic/ischemic encephalopathy from birth.”

♦ Refrain from mentioning a diagnosis such as “newborn asphyxia” to parents unless you have confirmed the information in the chart or with the delivering physician. Ensure that all members of the delivery team are cautioned on this point.

♦ Read the entire ACOG/AAP report, Neonatal Encephalopathy and Cerebral Palsy: Defining the Pathogenesis and Pathophysiology.
Reference

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Perinatal Genetic Testing

Introduction

In the last decade, advances in genetics and genomics have provided physicians with more knowledge about human diseases than ever before. With this knowledge and ability to identify at-risk individuals with “just a blood sample” comes the added pressure to provide a comprehensive family history/genetic evaluation of each new patient. In obstetrics, the two leading causes of infant mortality are perinatal conditions (pre-term delivery) and congenital malformations. Two percent of fetuses have a chromosome abnormality, 2% have a significant structural abnormality, and another 3% have a single gene disorder that will be evident by age 25. Thus, all conceptions have a more than 5% chance of an abnormal fetal outcome.

The current basic screening for couples or pregnancies at risk utilizes a combination of family history, maternal serum screening, and ultrasound surveillance. The purpose of this section is to review the indications for genetic counseling and prenatal diagnosis, and the diagnostic modalities available in prenatal diagnosis.

Indications For Genetic Counseling/Genetic Testing

◆ Family History of Genetic Condition
  The family history continues to be one of the most important identifiers for genetic risk. Uhrich et al. discovered through a pilot study that about 20% of patients seen for routine prenatal care were found to have an increased genetic risk based on a family history evaluation. The evaluation included the patient and her partner, as well as their parents, siblings and their children, and aunts, uncles, and their children. Therefore, information in addition to the routine family history questions about medical conditions should include details about stillborns and members with birth defects, mental retardation, or a known genetic disorder. Geographic or ethnic background and consanguinity should also be documented.

  Most known genetic disorders are caused by single gene defects and have a recurrence risk of 25% or 50%. Prenatal diagnosis could be possible for the at-risk fetus if a biochemical abnormality or a DNA mutation is associated with the disease. These couples should be referred for genetic counseling as early in the pregnancy as possible because coordination of the testing can take many weeks. Also, some genetic conditions (e.g., osteogenesis imperfecta) require samples obtained at chorionic villus sampling and not at amniocentesis for diagnosis.

  In other cases in which there is a specific family history of an X-linked condition for which there is no biochemical or DNA diagnosis, prenatal diagnosis is possible for sex determination only.

◆ Maternal Age
  Historically, a maternal age of 35 at the time of delivery has been used to identify women for amniocentesis to exclude fetal trisomy. This age was selected because the risk at 35 years for a liveborn with trisomy approximates the risk of second-trimester amniocentesis. The following table summarizes the incidence of Down Syndrome at midtrimester and at term for different maternal ages. The incidence of fetal aneuploidy at term is less than the incidences at the time of chorionic villus sampling or amniocentesis because of the natural spontaneous loss of chromosomally abnormal fetuses.
Incidence of Down Syndrome in Relation to Maternal Age

<table>
<thead>
<tr>
<th>Maternal Age</th>
<th>Incidence at Birth</th>
<th>Incidence at Amniocentesis</th>
<th>Incidence at Chorionic Villus</th>
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◆ Previous child or family history of chromosome disorder

The recurrence risk for a pregnancy with trisomy is about 1% for a woman who is less than 33 years until age 35, at which time her age-related risk will begin to supercede her previous risk. These women should be referred for genetic counseling. In families in which a child has a known structural chromosome abnormality, the parents may be at an increased risk and should be referred for genetic counseling.

◆ Neural Tube Defect

Seventy percent of neural tube defects are folate-dependent and arise as a result of multifactorial polygenic causes. In these cases, the recurrence risk for neural tube defects (NTDs) is about 2–4%. In addition, certain maternal conditions, such as valproic acid exposure and poorly controlled diabetes in the periconceptual period increases the risk for neural tube defect. Folic acid supplementation at 4 mg daily at least one month prior to conception and continuing through the first trimester is recommended for all women who are at an increased risk for a child with NTD.

Another 30% of neural tube defects arise as part of a chromosomal or genetic syndrome, and folate supplementation would have no role in prevention in subsequent pregnancies. More importantly, recurrence risks are generally higher than 2–4%, depending on the cause of the neural tube defect. For example, about 13% of conceptions with spina bifida and 2% with anencephaly are found to have a chromosomal abnormality. Spina bifida can also be found in an autosomal recessive condition called Meckel-Gruber syndrome, in which there is a 24% recurrence risk.
**Abnormal Maternal Serum Screening/Abnormal Ultrasound**

Genetic counseling and further assessment at a prenatal genetics center should be offered to all pregnancies in which fetal abnormalities are detected or suspected on ultrasound or when maternal serum screening is positive.

**Noninvasive Prenatal Diagnosis Testing**

**Maternal Serum Screening—Second Trimester**

This term refers to the measurement of biochemical markers in maternal serum between the 15th and 20th weeks of pregnancy to identify pregnancies that may be at an increased risk for Down Syndrome, neural tube defects or abdominal wall defect, or Trisomy 18. In the triple-marker screen, three analytes, alpha-fetoprotein (AFP), unconjugated estriol (uE3), and human chorionic gonadotropin (hCG) are measured. In the Quad Screen, the fourth analyte, dimeric inhibin A is added. The interpretation of each analyte is dependent on gestational age, maternal weight, ethnicity, and whether the patient has diabetes. The following table summarizes the pattern of analyte abnormality for Down Syndrome, Trisomy 18, and NTD/abdominal wall defect. All pregnant women who enter prenatal care prior to 20 weeks’ gestation should be informed of the availability of maternal serum screening.

**Serum Marker Screen Second-Trimester Screening**

<table>
<thead>
<tr>
<th></th>
<th>AFP</th>
<th>uE3</th>
<th>hCG</th>
<th>INH</th>
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</thead>
<tbody>
<tr>
<td>Down Syndrome</td>
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<td>↓</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Trisomy 18</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>NA</td>
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</table>

**Ultrasound**

Real-time ultrasonography has become an integral part of prenatal care. Currently, 60–70% of pregnant women in the United States will undergo ultrasound at some time during the pregnancy. In low-risk pregnancies, a midtrimester ultrasound (around 18–20 weeks’ gestation) in conjunction with maternal serum screening could be completed if the patient presents for obstetrical care prior to 20 weeks and ultrasound is available in the community.

**Preimplantation Genetic Diagnosis (PGD)**

This is a procedure that is used in conjunction with in vitro fertilization (IVF) in which a single blastomere is removed at the 6–8 cell stage and analyzed for chromosome abnormality or single gene defects. Situations in which PGD has been used include carriers of structural chromosome rearrangements in which there is a high percentage of chromosomally abnormal conceptions. Preimplantation genetic diagnosis allows the parents to transfer the chromosomally normal zygote to achieve a pregnancy rather than having to wait for prenatal diagnosis and termination of an affected pregnancy. Single gene defects in which a mutation has been identified can also undergo PGD and transfer of the unaffected zygote.

**Carrier Screening**

**Cystic Fibrosis**

In 2001, the American College of Obstetrics and Gynecology (ACOG) and the American College of Medical Genetics formalized their recommendations for carrier screening for cystic fibrosis. Specifically, CF screening should be available to the following individuals:

- Those with a family of CF
- Reproductive partners of CF patients
• Caucasian couples who are pregnant or planning a pregnancy
• Individuals of other ethnic groups if pregnant or planning a pregnancy

Because there are now over 1,000 mutations associated with CF, and because of the complexity of the clinical interpretation of the mutations, patients who are found to be carriers of a mutation should be referred for genetic counseling.

◆ Hemoglobinopathies
Individuals of African American, East Indian, Asian, and Mediterranean background should be evaluated for hemoglobinopathies. Hemoglobin electrophoresis should be offered to individuals of African American descent to screen for sickle cell trait (and variants). In screening for thalassemia, the complete blood count (CBC) with indices is evaluated initially. Individuals with abnormal indices should then be evaluated for iron deficiency with the appropriate studies and for thalassemia by hemoglobin electrophoresis. In rare cases, extremely severe iron deficiency could mask an underlying thalassemia which would not be evident until the patient’s iron stores were completely repleted.

◆ Tay Sachs Disease
This is an autosomal recessive condition of lysosomal storage in which the affected newborn cannot degrade a sphingolipid (GM2 ganglioside) due to a deficiency in the enzyme hexosaminidase A. Individuals of Ashkenazi Jewish ancestry have a risk of 1 in 27 to carry a mutation for this enzyme defect. Therefore, carrier screening should be offered.

Invasive Prenatal Diagnostic Testing

◆ Chorionic Villus Sampling (CVS)
CVS is a placental biopsy of the chorionic villi either transcervically or transabdominally between the 10th and 12th week of pregnancy. Its major advantage over midtrimester amniocentesis is that results are generally available earlier in pregnancy. In some cases, however, only biochemical testing can be completed on chorionic villi. Molecular testing may be so time-consuming that the period of uncertainty extends well into the second trimester, and in those cases CVS provides no advantage over amniocentesis. The disadvantages of CVS are a pregnancy loss rate of 1%, a 2% chance of yielding ambiguous results from chromosome mosaicism, and the inability to screen for NTD which is delayed until second-trimester maternal serum screening and ultrasound are completed.

◆ Midtrimester Amniocentesis
This term refers to the transabdominal removal of amniotic fluid from the uterus. In the midtrimester, analysis of the fluid is generally for genetic indications, whereas amniocentesis in the third trimester is generally for fetal pulmonary procedure. The procedure is typically performed under ultrasound guidance between the 15th and 18th week of pregnancy. The risk for pregnancy loss is about 1/250–1/400 among providers who routinely perform midtrimester genetic amniocentesis.

◆ Fetal Cordocentesis—Percutaneous Umbilical Cord Blood Sampling (PUBS)
This procedure is used to obtain a sample of fetal blood directly from the umbilical cord in utero under ultrasound guidance. Cordocentesis is used for diagnosis and treatment. In the former, genetic/chromosomal/biochemical testing can be completed on extracted fetal cells and/or DNA. In the latter, fetal blood transfusion due to anemia from isoimmunization or infections (e.g., parvovirus) can be completed. The risk of the procedure for fetal loss is about 1% among providers who routinely perform cordocentesis.