SECOND EDITION

Maternal and Infant Assessment for Breastfeeding and Human Lactation

A Guide for the Practitioner

Karin Cadwell
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Cynthia Turner-Maffei, MA, IBCLC is the national coordinator of Baby-Friendly USA, a faculty member of the Healthy Children Project, Inc., and adjunct faculty member of the Union Institute. She has extensive experience as a nutritionist and breastfeeding educator in WIC and other Maternal and Child Health programs. A member of breastfeeding coalitions on the local, state, and national levels, including the Massachusetts Breastfeeding Committee and the U.S. Breastfeeding Committee, she is also an author of *The Curriculum to Support the Ten Steps to Successful Breastfeeding*, *Case Studies in Breastfeeding*, and *Breastfeeding A-Z: Terminology and Telephone Triage*.

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Anna Cadwell Blair, PhD, CLC is a faculty member of the Healthy Children Project, Inc., and has focused her work primarily on evidence-based practice, ethics, and teamwork with maternal and child health in the area of community- and hospital-based work groups and task forces. Her master's degree is in Organizational Behavior. Studying Health Communication at the Union Institute, Anna's doctoral work resulted in research relating the positioning of the baby at the breast to breast and nipple soreness in the mother. She was one of the worldwide coordinators for the GLOPAR project. She is the co-author of *Toward Evidence-Based Breastfeeding Practice*.

Lois D.W. Arnold, PhD, MPH, CLC, IBCLC has been involved in donor human milk banking since 1978, when she became a donor—an event she describes as "life changing." She changed careers and became the assistant administrator for Hawaii Mothers' Milk, Inc. During this time she helped to found the Human Milk Banking Association of North America, Inc., and was one of the inaugural candidates for the IBCLC exam, becoming certified in 1985. She was the executive director of the Human Milk Banking Association of North America for nine years and is now the CEO of the National Commission on Donor Milk Banking, a focus of the Academy of Lactation Policy and Practice. She has published numerous articles in the field and has been a member of the International People to People Breastfeeding and Human Lactation delegations to China, Cuba, Sweden, Denmark, Latvia, Russia, and Romania, where she examined donor milk-banking practices and policies. She is known as the "mother of milk banks" in China. She represents donor milk banking on the United States Breastfeeding Committee and is the current chair of the Membership Committee. Lois also has had a private lactation consulting practice and joined the faculty of the Healthy Children Project, Inc. in 1994, where she has been a co-author of several books, including *Reclaiming Breastfeeding for the United States* and *The Curriculum to Support the Ten Steps to Successful Breastfeeding*.

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Acknowledgments for the Second Edition

We thank our sister faculty members, the participants of our training programs, and our colleagues in the field of human lactation for encouraging us to continue to explore what we know, how we know it, and how to articulate our understanding of the endlessly fascinating interchange between mother and baby that we call breastfeeding.

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Preface

This book springs from our experience in developing a course on assessment of the mother and infant in conjunction with the undergraduate and graduate degree programs in human lactation developed by the Healthy Children Project, Inc. under U.S. Department of Health & Human Services Contract 99-MCHB-75A. As we began to develop the framework for the assessment course, we searched for a text that would meet the anticipated needs of learners. We found that classic texts on maternal and infant assessment contained too little information about the unique characteristics of the breastfeeding mother and infant, instead focusing primarily on what is known about the bottle-fed infant. Turning to the lactation texts, we found that there were excellent pieces of helpful material sprinkled throughout many of the existing texts, but there was no one book that encompassed the material we envisioned. This book elaborates upon the unique components of the breastfeeding mother–infant dyad and provides this essential material in a single source.

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Introduction

Those who assist breastfeeding mothers and babies come from a broad range of educational backgrounds, from physicians and peer counselors, occupational therapists and nurses and social workers, high school graduates and postgraduate researchers. This richness of experience and viewpoint brings with it inherent challenges. There is no one common "language" spoken, no sole lexicon, and limited agreement regarding the etiology of problems. There are varied scopes of practice and different comfort levels with technology, terminology, and intervention strategies. This second edition enlarges on the first edition, striving to provide a center point for understanding the physical and behavioral contributions of the mother and infant to the breastfeeding relationship as well as providing counseling suggestions for commonly encountered situations.

The diversity of scope of practice of breastfeeding assessors presents some limitations to the assessment process. For example, the professional practice scope of many of those who assist breastfeeding families may not include tactile intraoral examination of the infant or tactile examination of the breasts. For this reason, we focus on the hallmarks of breastfeeding problems that can be seen, heard, or otherwise observed and encourage the assessor to assure further appropriate evaluation. Breastfeeding is a performance activity. Medical problems may appear during breastfeeding that are less noticeable during passive examination of the mother or baby. So, some problems that appear as "breastfeeding problems" may actually be symptoms of problems requiring a nonbreastfeeding medical evaluation. When this is the case, we have suggested some of the more common findings.

Most mothers and infants don't have medical problems. However, all assessors should be prepared to distinguish between breastfeeding problems, breastfeeding problems that are actually medical problems, and medical problems. Assessment offers insight into the integrity and interplay of the maternal and infant physical systems. Feeding is arguably the most intense interchange between caregivers and infants in the first months of life, encompassing two or more hours of face-to-face time daily. Because of the range of maternal/infant systems involved in lactation and feeding, we cannot underestimate the potential for uncovering a variety of physical challenges. The assessment of breastfeeding mothers and infants requires developing a broad and comprehensive view of the multifactoral components of successful breastfeeding.

It is our hope that this text will provide a framework upon which assessors can construct a well-rounded process for determining the breastfeeding status of moth-

ers and infants with whom they work. Assessment is one of the most important skill sets of those who assist breastfeeding families.

Because it is inherently impossible to tease breastfeeding problems apart to their infant and maternal origins, there is some overlap in the chapter material. This text can assist the assessor in seeking clues to the identification of the factors contributing to the challenges at hand, and thus to the construction of individual solutions to each breastfeeding situation. Assessment skills need a firm foundation as well as continuous updating and expansion. Knowledge about breastfeeding and human lactation is constantly expanding. The assessor's conceptual framework must be both broad and deep.

Because of the complex nature of the breastfeeding mother and infant, the assessor is reminded to practice the skilled art of detection in approaching breastfeeding problems. Breastfeeding problems rarely have one cause. There are many possible contributory factors interwoven in the maternal and infant breastfeeding systems.

It is essential to understand the optimal process of breastfeeding in order to discern those characteristics of feeding that are less than optimal. We have devoted one chapter to optimal infant characteristics, one to optimal maternal characteristics, and one to optimal breastfeeding characteristics. In this way, we have created a platform in which breastfeeding is the normal, uncomplicated physiologic process that follows giving birth. Suboptimal characteristics that can be assessed in the mother and infant are described in separate chapters.

Although past experience with similar cases can provide some direction for exploration, good assessment demands thorough examination of the unique aspects of the new situation. Breastfeeding problems that sound similar to those the assessor has seen in the past may have a completely different etiology. So, our philosophy is that rather than relying on past experience, the assessor should strive to see each mother–infant pair as a new mystery to be solved.

How to Use This Book

Within Sections I through III, the optimal components of breastfeeding are presented, followed by a discussion of possible deviations from the norm. The text is illustrated with 78 figures. Line art appears in the body of the chapter, while photographs appear in the color plate insert at the back of the book.

On the following page is a list of the icons that are used throughout this text to denote how the information discussed may be gathered.

Method	Symbol	How these clues may be gathered
Careful look		Looking closely
Interview		Asking questions, exploring maternal and infant history, including past and present experiences, and the meaning of these experiences
Lab tests		Reviewing laboratory findings
Listen		Listening to sounds
Measure		Determining weight and length of infant; volume of milk expressed; volume of supplements given, etc.
Medical diagnosis		Reviewing medical referral forms or records
Medical history		Reviewing medical records
Observe		Looking, observing visually
These additional icons are used:		
Notice		Clues requiring special follow-up, often referral for medical evaluation
Compensation		Directions for how to think about compensating for this problem
Counseling implications		Aspects of mother's knowledge to explore

Section I

Assessing Breastfeeding

Breastfeeding Dimensions

1

The physiology of breastfeeding

This chapter examines the characteristics of feeding at the breast, including these six essential elements:

- Demonstration of feeding readiness
- Attachment and suction
- Compression
- Hormonal response of the mother
- Position of the infant
- Compensation

Assessments of the first five elements determine the strategy (ies) the assessor will use to move a suboptimal breastfeeding to one that is more optimal.

For example, if the assessor determines that the baby isn't showing readiness to feed, the assessor should examine optimal and suboptimal characteristics of feeding readiness. When the situation is suboptimal, the sixth element comes into play—compensation. The assessor should determine how to lift the suboptimal characteristic into the range of optimal.

Breastfeeding integrates both infant and maternal components; feeding at the breast is quite different from most aspects of feeding from a bottle. Successful breastfeeding involves several maternal and infant systems. These six dimensions of feeding are examined seperately.

The first dimension: Demonstration of feeding readiness

The first dimension of breastfeeding starts before the baby is positioned at the breast. It begins with prefeeding behaviors. The baby is getting prepared for feeding and exhibits feeding readiness cues. There are cues that show early readiness and others that are late feeding cues. An early cue, such as the baby exhibiting rapid eye movement, can signal the mother to get ready to feed. The mother may find a place to sit down

to feed and unlatch her bra and begin to bring the baby close to nurse. The baby does not look awake and yet is showing a subtle sign of early readiness to feed. Feeding cues, such as rooting and hand-to-mouth activities, signal the mother that it is time to feed. Crying is a late feeding cue and the crying baby is harder to feed. See Chapter 4 for more information about feeding cues.

The second dimension: Attachment and suction

Sucking is the primary infant reflex involved in breastfeeding. However, in order to find the breast, the infant uses senses such as sight, smell, and taste. Once the breast area has been located, the rooting reflex helps the newborn find the mother's nipple. While rooting, the infant seeks the nipple and opens its mouth wide. This is "the gape." Once attached to the breast, an infant must be able to suck, swallow, and breathe in synchrony to achieve optimal feeding. Infants cannot be made to develop reflexes; however, occupational therapists have developed some techniques to train the muscles involved, primarily the tongue (Marmet & Shell, 1984; Wolf & Glass, 1992).

The suck reflex begins to develop in early fetal life. In fact, it has been observed as early as 15 to 18 weeks gestation (Wolf & Glass, 1992). At the breast, negative pressure or suction is created by the sealing of the mouth cavity (lips to breast in front, fat pads of the cheeks to breast on the sides, soft palate to tongue in the rear), causing a vacuum. Milk will flow from a region of higher pressure (the breast) to one of lower pressure (the mouth) when the jaw and tongue drop down to enlarge the oral cavity. This sudden expansion of space forms the teat as it causes the nipple to elongate about twice its resting length (Smith et al., 1988). The rapid elongation of the nipple plus the negative pressure of the sealed mouth draw the milk out of the breast.

Types of sucking

- Non-nutritive suck (NNS): Stable lengths of bursts and duration of pauses
- Nutritive suck (NS): A complex pattern that varies over feeding

The length and pattern of bursts (flow) and pauses (no flow) depend on the timing and the size of the let-down (Wolff, 1968).

- Nutritive suck: 1 per second
- Non-nutritive suck: > 1 per second

The third dimension: Compression

Compression, or positive pressure, is created by the closure of the jawbones on the "teat," which is formed from both the nipple and breast tissue. The infant then uses its tongue, cheek, and jaw muscles to rhythmically massage and compress the teat. The mechanical pressure exerted by the jaws, hard palate, and tongue on the breast forces milk along the cupped tongue to the back of the baby's throat where a bolus (ball) of milk forms to be swallowed.

The fourth dimension: Hormonal response of the mother

In contrast to bottle and cup feeding, breastfeeding is not merely a mechanical function. It is also driven by the mother's hormonal responses. The massage-like motions of the infant's hands at the mother's breast, combined with rapid stretching of the nipple in the mouth of the infant, cause a spike in oxytocin levels, which drives the milk ejection reflex (Matthiesen, 2001). Oxytocin release is also affected by conditioned-response triggers—that is, the mother gradually learns to let down (eject) her milk in response to environmental cues such as smelling her infant or sitting in her nursing chair. Thus, the flow of milk does not operate by suction, or compression, or hormones alone.

The fifth dimension: Position of the infant

The infant's position and latch affect the removal of maximal amounts of milk from the breast.

Positional attributes include the following:

- The angle of the infant's mouth opening
- The outward flare of the infant's lips
- The distance of the infant's nose and chin from the breast
- The alignment of the infant's head, shoulders, and torso
- The relation of level of the infant's mouth to the level of the mother's breast and nipple
- The tilt of the infant's head relative to the breast
- The extension of the infant's tongue
- The position of the nipple between the infant's tongue and palate
- The contour of the infant's cheek line
- The position of the infant's chin and nose in relation to the breast

The sixth dimension: Compensation

Anything that diminishes the other five dimensions needs to be accounted for, including the following:

- Maternal and/or infant discomfort
- Supplementation via bottle, cup, or finger
- Congenital anomalies
- Nipple shields and other devices
- Pain for mother and/or infant
- Mother's motivation and other psychosocial aspects
- Infant's temperament/state
- Low milk supply
- Mother–baby separation

An example of a situation that calls for compensation in other dimensions is breastfeeding the premature infant:

The first dimension: Approach and feeding readiness cues

The preterm infant may take considerable time from the moment he wakes up until he displays feeding cues. His actual competence in rooting, latching-on, and sucking increases with practice. Feeding cues may be more subtle.

The second dimension: Attachment and suction

Preterm infants often have smaller buccal (cheek) fat pads, making it more difficult for them to stabilize the nipple and breast within the mouth.

The muscle and nerve development of preterm babies may result in sucking behaviors that differ from healthy, term infants. These include

- Prolonged licking and tasting
- Single sucks
- Short sucking bursts (2–9)
- Long sucking burst (> 10)
- Single, repeated bursts

Compensation for these differences may include using upright positioning during feeding, taking care to assure deep latching, keeping the weight of the breast off the chin, by using the Dancer hand hold, and consideration of the need for supportive equipment including breast pumps and nipple shields.

The third dimension: Compression

The smaller mouth of the preterm infant may reduce its ability to get a large mouthful of breast tissue. Using upright positioning and teaching the mother how to achieve a deep latch may be a helpful compensation. Milk expression may be needed after early feeds to remove additional milk, releasing pressure in the breast in order to maximize milk production.

The fourth dimension: Hormonal response of the mother

Typically, the mother of a preterm infant has begun milk expression in order to trigger her milk-making hormones, and to collect colostrum and milk for her baby. If the mother has been separated from her baby and is pump dependent, her response while pumping may be triggered by

- Pictures of the baby within the mother's view
- A piece of the infant's clothing or the infant's blanket that the mother can hold and smell
- A cassette tape of the infant's sounds that the mother can listen to
- Guided imagery

Hormonal response can be estimated by evaluating milk transfer. (See Appendix A for procedure.)

The fifth dimension: Position of the infant

To support breastfeeding success for the premature infant, the infant's arms and legs should be flexed toward his trunk, with the infant's mouth in front of the nipple and the infant's head, neck, and body securely supported.

Description of functional suckling at the breast

Feeding cues observed:

- Licking, tasting, nuzzling (familarizing behaviors)
- Gape (wide-open mouth)
- Nipple and breast tissue drawn deeply into infant's mouth
- Lips and cheeks form a seal; lips flange
- Tongue reaches over gum ridge and behind lower lip
- Anterior tongue forms a groove, cupping the breast; peristalsis begins (tongue tip stays at the front of the mouth)
- Negative pressure caused by sealed cavity draws the nipple (2–3 times original length) out past the junction of the hard and soft palate
- If nipple is stretched sufficiently, oxytocin releases, driving let-down (if nipple is pinched and mother experiences pain, adrenaline may interfere with oxytocin release)
- Lower jaw drops and the nipple expands to fill the inside of the mouth
- Milk flows
- Infant swallows
- Infant breathes
- The suck-swallow-breathe rhythm continues

Figure 1–1 indicates an infant well-positioned and attached to the breast.

FIGURE 1–1 Well-attached infant

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Optimal Breastfeeding Dynamics

2

Introduction to Breastfeeding Assessment

Breastfeeding assessment examines positioning and attachment of the infant to the breast and the transfer of milk and the experience of feeding for mother and infant. "No assessment, inaccurate assessment, or assessment based on assumption, rather than clinical observation, can result in deleterious outcomes for mothers and infants" (Shrago, 1992).

The importance of correct positioning and the latch-on of the infant to the breast

Optimal breastfeeding is an enjoyable experience for both mother and infant. Sufficient milk is transferred without damage to the breast or nipples. There is no pain.

Although faulty breastfeeding technique can be corrected, findings suggest that it is best to encourage optimal technique in the early hours after birth or as soon as possible if there has been extended separation of mother and baby (Righard, 1998).

The process of optimal breastfeeding

The process of optimal breastfeeding includes the mother:

- Responding to observed feeding cues
- Holding the baby with nose to nipple and watching for the mouth to gape
- Moving the infant well onto the breast during the gape so that the infant:
  - Forms a seal with the lips
  - Positions the nipples comfortably deep within the mouth
  - Suckles and transfers milk
  - Releases the breast, ending the feed

FIGURE 2–1
Infant gapes in approaching breast.
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Characteristics of optimal breastfeeding

Observing an optimal feeding

An optimal breastfeeding session may be observed when the feeding time is not forced by the assessor's schedule. Instead, the time should be right for mother and infant. Stimuli in the environment may need to be limited (e.g., lights dimmed, noises muted, movement slowed). The environment should be comfortable, with few noises and little movement. It may be difficult to observe an optimal feeding if the mother and infant are uncomfortable and/or not ready to feed. The assessor should first assure the comfort of the mother and the infant. Mother may need help finding a comfortable chair or other location to breastfeed. She may need to be encouraged to make adjustments needed for comfort (e.g., arranging clothing, getting a drink, or making a trip to the bathroom). The infant may need to be changed, undressed before being placed skin-to-skin with the mother, and curled into a comfortable position. If feeding cues are seen, encourage mother to proceed directly to feeding without delay. Once skin-to-skin, the infant may indicate its readiness to feed and begin feeding with little interruption.

Observing for feeding cues and responding to cues by feeding the infant

The breastfeeding session is optimally initiated when the infant exhibits appropriate cues—the infant's signal of readiness to feed. The infant may be receptive to feeding even when the eyes are closed. Feeding cues are:

- Rooting—Turning the head, especially with searching movements of the mouth; "The infant actively roots for the breast, turning her head from side to side and opening her mouth wide" (Kitzinger, 1989).
- Increasing alertness.
- Flexing the legs and arms.
- Bringing a hand to the mouth, sucking on a fist or finger.
- Moving the mouth and tongue.

FIGURE 2–2
Infant breastfeeding–note angle of mouth opening.
Used with permission. Healthy Children Project

Interview
Observe
Listen
Lab tests
Measure
Medical diagnosis
Medical history
Notice
Careful look
Compensation
Counseling

- Crying—Crying is considered a feeding cue but usually does not begin until the other, more subtle cues have failed to elicit the mother's attention. It is more difficult to solve feeding problems when the infant is crying. It is much easier to feed well when those cues that precede crying are used to signal feeding. (See Figures 4–3 and 4–4.)

Eliciting the gape (wide-open mouth) before attaching to the breast

Gaping occurs when the infant's mouth opens wide (Figure 2–1). "With mouth agape like a hungry cuckoo, the infant comes to breast, his breathing rapid and excited" (Kitzinger, 1989). It is important that the breast and nipple are not pushed into the infant's mouth in the absence of a gape because this is unlikely to result in optimal positioning of the nipple or later appropriate compression of the breast during suckling. Although a variety of lip-tickling techniques have been suggested to encourage the infant to achieve the widest possible mouth opening (such as tickling the infant's lower lip or both lips with the mother's nipple or finger), this should not be necessary for intact infants. Intact infants typically gape without lip stimulation if the infant's nose is placed near or touching the nipple, and then the infant is moved a few inches back from the nipple.

The sequence is as follows:

- Place the infant's nose close to the nipple to assist the infant in finding the breast using sight and/or smell.
- Move the infant 1 to 3 inches away from the nipple.
- Observe the infant gape, opening his or her mouth very wide.
- Repeat the process if the infant fails to gape. If the infant does not attach correctly after the gape, break suction if needed and try again.

Moving the infant onto the breast during the gape, maintaining a wide-open mouth, and positioning the lips to later compress the milk ducts

"At the height of the gape move the infant quickly to the breast, aiming his bottom lip as far away as possible from the base of the nipple" (Mark-It TV, 1996). In optimal gape, the infant attaches to the breast with a wide mouth that has an observed angle of opening of 140° or more (Figure 2–2). In humans, only the lower jaw can

move to enlarge this angle. Also, the infant's head must be able to tilt backwards to achieve this angle, so there must not be pressure against the head from the mother's arm, hand, or from a pillow. The angle of the head tilt must be sufficient to accommodate the dropping of the infant's jaw during suckling. "Move the infant to the breast quick [sic] at the height of the gape, so the chin and lower jaw meet the breast first. The infant feeds with a wide mouth and an active tongue" (Mark-It TV, 1996).

Sufficient areola and breast tissue must be in the infant's mouth in order for the infant to properly milk the breast. It is estimated that the ideal placement of the jaw is 1 ½ to 2 inches beyond the base of the nipple. The wide-open gape, optimally placed well onto the breast, will not position the mouth symmetrically around the areola. More of the lower portion of the breast will be in the infant's mouth. Depending on the diameter of the mother's areola, some portion of the areola may be seen at the top of the breast, but be covered at the bottom. The infant's mouth should not be evenly centered around the nipple; it is not like a bull's eye. "You may think that the center of the mouth is halfway between the top and the bottom lip and . . . forget that she has a huge tongue" (Pakkho, 1994).

Some mothers feel more comfortable supporting or holding up the breast. If the mother chooses to do this, her hand should be placed so that

- The breast falls naturally.
- Compression of the ducts does not occur.
- The baby has unobstructed access to the nipple and areola.

Positioning the nipple

The nipple should be positioned halfway between the top of the tongue and the roof of the mouth. Optimal position of the mother's nipple inside of the infant's mouth

- Evokes the secretion of the hormones prolactin and oxytocin,
- Allows for the passage of the maximum milk flow, and
- Places the nipple where it is not abraded during the suckling process.

Ultrasound studies show that the nipple increases in both length and diameter during the feeding (Smith et al., 1988). Optimal suckling requires the nipple to enlarge in order to

- Contact the roof of the mouth and extend to the soft palate without abrasion.
- Contact the tongue. The tongue's peristalsis forms a bolus, or ball, of milk and moves it to the back of the mouth.
- Contact the inside of the cheeks. Sucking pads will develop inside the cheeks as the infant matures and grows.
- Stretch as the jaw drops allowing maximal mouth opening (Smith et al., 1988).
- Signal the secretion of prolactin in response to the tactile stimulation of the nipple skin during the nursing.
- Signal the release of oxytocin in response to the stretching of the nipple.
- Deliver the maximum amount of milk rapidly, thereby signaling the milk-making cells to increase production. The faster the milk is removed, the higher the fat content (Cregan & Hartman, 1999).

The nipple should not be misshapen, abraded, fissured, bruised, or blanched by

nursing; any of these may signal incorrect nipple positioning. The infant should be gently removed and repositioned. Color Plate 2–1 demonstrates how the mother may use her finger to break suction. With good attachment, there should be no pain, just a gentle feeling of tugging.

Forming and maintaining the seal with lips, tongue, and breast

The nipple and the breast tissue should remain in the infant's mouth during nursing, although breast movement in concert with the infant's suck may occur. The seal is formed between the infant's lips and tongue and the mother's breast. The seal is supported by the positioning of the infant's head and body.

With correct seal, the

- Nipple remains in the mouth during suckling.
- Breast tissue is smooth, with no observable wrinkling at the juncture of the mouth and the breast. The mother's breast may move rhythmically as the infant sucks, but remain smooth at the mouth/breast juncture.
- Top and bottom lip are not turned in (Color Plate 2–2). The lower lip is flanged back outward. The upper lip is visible and rests on the breast to complete the seal.
- Cheek line is smooth, not dimpled or broken. The observation of dimpling or indrawing of the cheek indicates that there is a positioning problem; the infant's cheeks should not sink inward.
- Tongue is extended. The tongue should be positioned past the gum line of the lower jaw, cupping the breast. The tip of the tongue is visible only if the lower lip is pulled back.
- Swallowing of milk is the only sound heard. There is no smacking, clicking, whistling, or noise other than swallowing. (In general, it is rare to hear audible swallows during the colostral phase of lactation.)

Head position and body position align the infant at the breast, stabilizing the head and throat and optimizing both the seal and the airway. Characteristics of the ideal head and body position of the infant are

- The infant's nose and chin should be close to the breast.
- The infant's head is not properly positioned when:
  - The chin is away from the breast
  - The nose is far away from the breast
  - The nose is indenting the breast
  - The nose and chin are both away from the breast
- The infant's height at the breast is described as the infant's nose opposite to the mother's nipple before the latch. As the infant's head tilts back for the latch, the nose is no longer at the height opposite the nipple.
- The infant's body should be turned toward the mother's body in a straight line. The infant's head aligns with his or her navel, hips flexed. The infant's arms should not cross over the infant's body. In the early days, the infant's hands knead the breast. This is associated with increased oxytocin secretion, so hands should not be anchored away from the breast.

FIGURE 2–3
Cradle or Madonna position.
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- The infant's body should be rotated toward the mother. This may be called "tummy-to-tummy" or "chest at the breast" or "chest-to-chest."

Suckling and transferring milk

Sucking occurs when the infant begins to nurse. "Effective infant suckling occurs when as much areola and breast tissue as necessary are drawn into the mouth as he latches on to form an airtight lock around the breast with lips flanged. . . . Sucking is unproductive unless there is also swallowing" (Vida Health Communications, 1999).

The infant's nursing dynamic should involve

- Bursts of two sucks to one swallow, or one suck to one swallow.
- The infant sucks vigorously, stimulating the flow of milk.
- The infant sucks rhythmically. Sucking bursts are separated by pauses and the infant swallows regularly.
- When the tongue is lowered, milk ducts in the nipple open and milk flow occurs. When the tongue is raised, milk ducts do not open and milk does not flow (Ramsay et al., 2004).

Most efficient milk transfer is associated with a

- Suck-to-swallow ratio of 2:1 and/or 1:1, such as *suck-suck-swallow*, *suck-suck-swallow*, *suck-swallow*, *suck-swallow*. Ratios above 8:1 or *suck-suck-suck-suck-suck-suck-suck-suck-swallow*, are associated with poor milk transfer unless interspersed with 2:1 or 1:1 ratios. Ratios of 5:1 or higher are called "flutter suck" or "non-nutritive suck" and are associated with piston

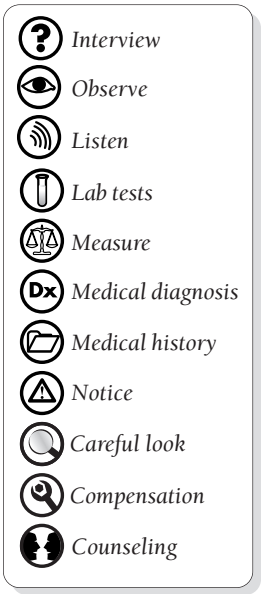
movements of the jaw and poor weight gain in the infant.

Swallow of the milk bolus may be confirmed by auscultation (listening with a stethoscope) of the infant's throat.

Before and after weights of the infant using a precise digital scale can be used to estimate the volume of milk transferred (see Appendix A):

- Rocker motion of the infant's jaw extending toward the ear. Ideally, ear movement is seen. Piston or "up and down" motion of the jaw is not associated with efficient milk transfer.

Releasing the breast, ending the feed



Optimal nursing sessions are ended

- By the infant. This should always be true; only the infant knows when his or her stomach is full.
- With the infant relaxed. The infant's hands are open, its brow smooth and toes curled, indicating satisfaction. The infant may or may not be asleep, although the eyes are often closed. Mothers describe the look of their satiated infant as "bliss."
- With the mother's nipple unchanged from the shape and color it had at the beginning of the feeding.
- With evidence of sufficient milk transfer: adequate weight gain of 1/2 pound to 1 pound per week.
- With the mother feeling comfortable and relaxed, no report of pain.

Optimal nursing is not defined by

- Whether the infant nursed on one breast or two.
- How much time passes until the infant next has a feeding cue.
- Whether the infant "sleeps through the night," "sleeps well between feeds," or "goes several hours in between feedings." Calorically deprived infants are sleepy and apathetic feeders. Sleepy infants are usually a warning sign, not a sign of satisfaction.
- Whether or not the infant is "good." So-called "good" infants may not have sufficient energy to draw the mother's attention.
- Whether or not the infant shows the same behavior for each feed or each day.
- Whether or not the infant takes milk from a bottle after the feed.
- Whether or not milk can be expressed after the feeding.

Positions for Breastfeeding

There are many positions used by breastfeeding dyads. Among those most commonly used are

- Cradle or madonna position (Figure 2–3). The infant lies on its side, facing mother, with its neck, head, and upper back resting on the mother's forearm next to the breast to be used. (Mother may choose to use her opposite hand to support the breast.)
- Cross-cradle position. The infant lies on its side, facing mother, with its neck, head, and upper back resting in the mother's palm and forearm of the

FIGURE 2–4
Cross-cradle position for premature infant.
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opposite side of the breast being used. Mother may use her other hand to support the breast. This position is especially useful for newborn and preterm infants (Figure 2–4).

- Football or clutch position (Figure 2–5). The infant lies on its side or back, curled between the side of mother's chest and her arm. The infant's upper body is supported by mother's forearm. The infant's hips are flexed up along the surface that the mother leans against. Color Plate 2–3 shows twins feeding in this position.

FIGURE 2–5
Football or clutch position.
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FIGURE 2–6
Sidelying position

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- Sidelying position (Figure 2–6). The mother lies on her side. The infant is placed on its side, lying chest-to-chest with mother. Figure 2–7 demonstrates an adaptation of this position to meet the needs of mothers after a Cesarean birth.

FIGURE 2–7
Sidelying in hospital bed.

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Assessing a Problem Feeding

3

Introduction

One of the difficulties of assessing the dynamics of breastfeeding is that the assessor must rely on the outside appearance of an intricate, internal choreography of reflexes: suck-swallow-breathe on the part of the infant, and manufacture and ejection of milk on the mother's part. Few tools exist for visualizing the interior workings of breastfeeding. Ultrasound and x-ray studies have been helpful in research and in examining the feedings of infants presenting with severe feeding difficulty; however, these tools are not accessible to many assessors. Most assessors rely on a range of visual and auditory clues to identify and improve feeding difficulties. It is important to recognize that the presence of clues is not necessarily problematic. In fact, one of the most difficult challenges for the novice breastfeeding assessor is to refrain from correcting the obvious "less than ideal" components of the feeding techniques of nursing couplets. The only components that need improvement are those that result in the following:

- Discomfort for the mother
- Discomfort or airway obstruction for the infant
- Inadequate milk production and/or transfer

Many thriving, happy nursing dyads have been observed to feed in unusual or uncomfortable-looking feeding postures. The assessor should avoid making changes unless problems are present.

Poor positioning and incorrect latch can lead to sore, painful nipples as well as inadequate milk transfer, which can contribute to the infant's failure to thrive.

In one study, 94% of the mothers who had breastfeeding problems also had incorrect, superficial nipple sucking (Righard, 1998). Only 10% of the mother-infant pairs in the group without breastfeeding problems had incorrect positioning and latch-on. Suboptimal sucking technique (also called "nipple sucking" or "bottle sucking the breast") was much more common among mother-infant pairs with nursing problems of any kind (including infants who are restless between feeds) than among those breastfeeding without problems (94% versus 10%, P 0.0001).

The infant should be observed for feeding cues and approach behaviors indicating readiness before attempting feeding assessment. It is unlikely that appropriate feeding will be observed if the mother and infant are not ready to feed. Prolonged skin-to-skin is helpful in achieving feeding readiness as it has been shown to improve motor and state organization. Returning to skin-to-skin contact is an essential intervention for feeding difficulties. Distressed mothers and infants should be helped to be calmed before feeding is attempted.

Gape

It is expected that the infant will open its mouth wide when brought within range of the nipple. Variations on the wide-open gape associated with feeding problems are explained in the following section.

No gape

Lack of a gape reflex is of concern and needs to be further evaluated. A consistent lack of gape should be referred for pediatric work-up. The following are related conditions:

- Prematurity
- Congenital condition (neurologic or muscular impairment)
- Malnutrition
- Dehydration
- Feeding aversion due to stress or illness

Narrow gape

Color Plate 3–1 shows a gape of 90° or less, which is associated with nipple soreness and inadequate milk transfer. The infant may exhibit a narrow gape for a variety of reasons, including the following:

- Inappropriate timing of feeding (e.g., attempting to feed the infant when infant is not hungry)
- Lack of coordination of feeding between mother and infant (e.g., mother attempting to force the feeding or the feeding position)
- Poor positioning (e.g., infant's head tilted too far forward to fully drop lower jaw to achieve wide-open gape) (Color Plate 3–2)
- Oral defensiveness (tight mouth) (Color Plate 3–3) Infants who have experienced invasive and/or painful oral procedures may become orally aversive and protect their mouths by clamping the jaw or pursing the lips. Examples of such procedures include deep or vigorous suctioning, rough oral examinations, and gavage tube placements
- Receding chin, unable to touch breast; congenital conditions such as micrognathia (abnormal smallness of the jaw); Pierre Robin syndrome (micrognathia combined with cleft palate, downward placement of the tongue, and absent gag reflex), and other malformations of the lower jaw may limit the ability of the infant to feed well. Color Plate 3–4 shows a lateral view of an infant with a very receding chin (mandible). The poor juxtaposition of

mandible and maxilla may cause breastfeeding problems. Infant is supine and yawning, demonstrating maximal mouth opening possible for this infant.

Changes to positioning of the infant with these conditions may increase milk transfer. Positions that put the infant in an upright, vertical position may increase amount of breast grasped.

When the infant's chin does not, or is unable to, touch the breast during a feeding, grasp of the breast and, thus, potential transfer of milk, is limited.

- Chin tucked. When the infant's head is too far forward, maximal jaw opening is limited because of compression of the jaw against the chest. More optimal jaw opening can be achieved if the baby is allowed to tilt its head back.
- Nose blocked by breast. Improper position can cause the infant's nostrils to be blocked. The infant will be unable to feed effectively because of the need to break suction in order to breathe.

Gape seen but does not function as part of progression of feed

The infant opens its mouth and is seen to root and gape but does not seem to sense the presence of the nipple and breast in its mouth and does not latch on. This may be related to the following:

- Overly full or edematous breast
- Short, flat, or inverted nipple
- Prematurity
- Neuromuscular difficulties
- Previous feeding with alternative method

Seal

To trigger the rapid expansion of the nipple in the infant's mouth and, thus, the flow of milk, the infant must create a seal at the breast with its lips, mouth, and throat. Variations on the ability to form a seal at the breast include the following:

Unable to form a seal

- Cleft lip. This congenital anomaly is a separation of the upper lip. Clefts can occur on one side (unilateral) or both sides (bilateral). The infant shown in Color Plate 3–5 has a unilateral cleft lip and cleft palate.

Depending on the extent of the cleft and the fullness and the flexibility of the mother's breast tissue, the cleft may be closed by angling the infant at the breast in such a way that the cleft is filled with breast tissue. Some mothers have been successful at using their thumb to close the cleft and create the seal necessary for successful feeding.

- Cleft palate. The presence of this opening in the roof of the mouth makes it difficult for the infant to attain a true seal at the breast. Color Plate 3–6 offers an interior view of the unilateral cleft.

Some mothers are successful at using angled latch-on to fill a unilateral cleft. A palatal obturator—a dental plate made to cover the cleft—has been used to enhance breastfeeding for some cleft palate infants. A nipple shield may also cover the open-

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ing in the palate during feeding. Milk transfer and growth must be monitored. Most mothers will need to express milk in order to maintain an optimal supply.

- Choanal atresia. The infant with this congenital opening between the nasal cavity and the pharynx may have difficulty sustaining a seal at the breast as well as with coordinating sucking, swallowing, and breathing.

Infants with craniofacial anomalies need intensive follow-up with frequent weight checks.

- Muscular incapacity secondary to another medical condition.

Able to form a seal but difficulty maintaining the seal

If the infant is able to form a seal but has difficulty maintaining the seal and holding the nipple in his or her mouth, it may be related to the following situations:

- Poor positioning. Awkward positioning at the breast can make it difficult for the infant to maintain a seal, particularly when the infant's head is turned toward the shoulder.
- Congenital anomalies, such as cardiac, respiratory, or neuromuscular, in the infant.
- Prematurity
- Palatal anomalies. In addition to clefts of the palate, infants with unusually high or misshapen palates may have difficulty maintaining a seal at the breast (Marmet & Shell, 1993). Intubation of a premature or ill infant may result in a grooved palate (Wilson-Clay & Hoover, 2005). Submucosal clefts have been associated with feeding difficulties (Wilson-Clay & Hoover, 2005).
- Jaundice. The infant experiencing hyperbilirubinemia "may be depressed and lethargic and therefore may not nurse well" (Lawrence & Lawrence, 2005). Visible jaundice, or yellowing of the skin, requires medical evaluation.
- Dehydration/malnutrition. Poorly hydrated and/or poorly nourished infants may have difficulty sustaining the energy required to maintain the seal and suckle at the breast.

Tongue

The tongue plays a major role in feeding. The tongue draws in nipple and breast tissue to form a teat. It also seals off the back of the mouth cavity and forms a central groove that stabilizes the teat, forms the ball or bolus of milk, and moves the bolus toward the back of the mouth where it is swallowed (Wolf & Glass, 1992).

Feeding problems associated with the tongue include:

- Inability to extend the tongue beyond the alveolar gum ridge. This may be due to congenital anomaly, such as short tongue and ankyloglossia (abnormal shortness of the frenulum or membrane under the tongue). Ankyloglossia is also known as tight lingual frenulum, or "tongue-tie." This anomaly, shown in Color Plate 3–7, is associated with painful latch-on and nipples in the mother and potential poor milk transfer and weight gain in the infant. Infants with ankyloglossia may be able to nurse well or may have difficulty. These infants may be better able to nurse in an upright position with a wide-open mouth and a deep grasp of the breast. Infants who are unable to elicit

good milk flow or whose mothers have pain while feeding should be referred to a physician for evaluation and possibly "clipping" the frenulum.

- Difficulty forming a groove with the tongue or asymmetric appearance of the tongue. This may be associated with neurological and/or muscular impairment.
- Hypertonicity. High oral muscle tone in the infant is associated with several appearances of the tongue:
  - Elevated tongue tip
  - Humped tongue (tongue is compressed from front to back)
  - Bunched tongue (tongue is compressed from side-to-side)
  - Tongue thrusting (forceful expulsion of the tongue during feeding)
- Hypotonicity. Low muscle tone is associated with tongue protrusion (tongue often protrudes between lips at rest as well as during feedings). In an effort to maintain head and neck position, the infant with low tone may also tense the muscles of the mouth, resulting in elevated tongue tip and tongue retraction (Wolf & Glass, 1992).

Lip

Ideally, the lips flare out to form the outward seal to breast tissue. When the infant is not positioned properly, the lips may not flare and seal correctly. Following are other feeding problems associated with the lips:

- Cleft lip.

  Depending on the extent of the cleft and the fullness and the flexibility of the mother's breast tissue, the cleft may be closed by angling the infant at the breast in such a way that the cleft is filled with breast tissue. Some mothers have been successful at using their thumb to close the cleft and create the seal necessary for successful feeding.
- Limitation of the ability to flare the upper lip and make a seal may be caused by tight labial frenulum (the membrane attaching the upper lip to the gum). Referral for further evaluation of the frenulum should be considered.

Milk transfer

Many factors affect an infant's ability to transfer an adequate amount of milk during a feeding. The following are hallmarks of possible milk transfer problems. However, many well-nourished infants exhibit the same type of activity without associated problems with milk transfer.

Shallow sucks with little swallowing seen (piston motion)

Shallow sucking is associated with limited milk transfer and little swallowing. A piston-like motion of the chin moving rapidly up and down in a biting-like action is often seen with shallow sucking, as shown in Figure 3-1. Excessive shallow sucking may be related to:

FIGURE 3–1
Piston-like motion.
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- Prematurity. This may influence the infant's physiologic ability and energy level.
- Poor positioning. This impacts the depth of latch, limiting the amount of breast tissue compressed, thus limiting the potential for milk transfer.
- Malnutrition and dehydration. Infants with these problems may be unable to sustain active feeding for a long period of time.
- Restriction of jaw movement secondary to medical condition of the baby.
- Congenital anomaly such as cleft palate or sub-mucosal cleft, high palate etc.

If only shallow sucks are observed, assess for milk transfer.

Rocker motion of the jaw is seen but no swallows heard

A rocker motion of the jaw describes the motion of the jaw swinging forward from the hinge beneath the ear, rocking the jaw forward to indent the breast, as is indicated in Figure 3–2. The presence of rocker motion without audible swallowing may indicate:

- Poor positioning and/or latch.
- Lack of milk to transfer—low milk supply.

FIGURE 3–2
Rocker motion.
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Misshapen nipple at the end of a feeding

The appearance of the nipple when the infant detaches from the breast can assist in detecting improper attachment. The nipple should come out of the infant's mouth as an everted, tubular shape, markedly longer than its resting position, but otherwise normal in appearance. When suboptimal breastfeeding occurs, the nipple may appear to be pinched and may bear temporary white marks, or be otherwise misshapen immediately after the feeding ends. Color Plate 3–8 shows an angled/beveled nipple just after breastfeeding. This indicates a sucking, latch, or positioning problem.

Assessing milk sufficiency

Concerns about inadequate milk supply are extremely common among breastfeeding women. In fact, "not enough milk" is the most common reason women give worldwide for early cessation of breastfeeding. It is widely acknowledged that fears about milk worldwide inadequacy may reflect either a real problem or a perceived problem. An adequate milk supply is crucial for infant growth. It is therefore imperative to carefully assess any concerns that the mother may have about milk supply and to distinguish between true milk insufficiency and perceived inadequacy. The following are methods for assessing the volume of milk transferred:

- Visual cues. The well-nourished infant eagerly seeks the breast, latches on, and feeds vigorously with rocker motion of the jaw. As the infant nurses and receives milk, its body tone will soften, its hands will open, and its head will fall back slightly. Under the influence of hormones in her body, the mother's body tone also softens and she seems more relaxed.
- Auditory clues. When there is an adequate milk supply, swallowing will be heard during the feeding, after the colostral phase of milk production.
- Weight gain. The infant will gain weight appropriately, increasing ½ to 1 pound of body weight in each of the early weeks. When available, the use of a precise digital scale with breastmilk intake function, as seen in Color Plate 3–9 and described in Appendix A, can help to document the volume of milk transfer during a feed. Many experienced assessors have been surprised to learn that little or no milk was transferred during a nursing that had all the hallmarks of an optimal feeding. Likewise, some passively nursing infants transfer a large amount of milk. Use of pre- and post-feed weights provide objective data to estimate milk transfer.
- Infant output measures. The infant should pass meconium (tarry, black stool) within the first 24 hours of life (American Academy of Pediatrics [AAP], 2005). The healthy infant will have
  - Three to five urinations and 3 to 4 stools per day by 3 to 5 days of age.
  - Four to six urinations and 3 to 4 stools per day by 5 to 7 days of age.

Color

Maintenance of skin and membrane color, heart rate, and oxygenation at the breast is characteristic of the mature, healthy infant. Inability to maintain these markers of infant physiologic stability during feeding may reflect the following:

- Prematurity
- Congenital anomaly, especially cardiac
- Illness, such as sepsis
- Exposure to medications and other drugs

Assessing a breastfeeding

Wolf and Glass (1992) suggest a five-step assessment/evaluation process:

1. Gather information and plan for the visit.
   - Review any pertinent information prior to interviewing the mother and infant. This includes review of any information or documentation available concerning this mother and infant (e.g., the mother's and/or infant's chart, notes from telephone conversations, notes from referral source, etc.). Planning includes assembling any items and equipment that are expected to be used during the assessment (e.g., comfortable chair for mother, infant scale, etc.).
2. Feeding observation entails three portions:
   - General observation: The assessor's observations regarding the physiologic status of and general interaction between the mother and infant.
   - Naturalistic observation: Observation of a portion of a usual breastfeeding interchange between mother and infant. This is best performed without intervention from the assessor.
   - Elicited observation: Observation of the outcome of assessor-suggested modification of aspects of a feeding (e.g., changes to position, attachment, etc.).
3. Exploration of strategies for improvement:
   - The development of hypotheses for improving the feeding interaction based on history and observed phenomena
   - Discussion with mother of hypotheses generated, including pros and cons of various methods for improving the feeding outcome
   - Testing of agreed strategies
4. Synthesis of a plan:
   - All observed data, hypotheses, and strategies are synthesized into an action plan for feeding management that is agreed upon between the assessor and the mother.
5. Communication of results:
   - Reiterate findings and action plans for the mother. The language used to describe the situation is extremely important. The assessor should take great care to avoid terminology that blames, negatively characterizes, or labels the mother or infant. Review plans with the mother to assure that the plan is achievable and agreeable to all parties.
   - Document the outcomes of the assessment and evaluation.
   - Communicate findings to key healthcare providers in accordance with mother's consent to release information. Clearly identify and refer any items that need further medical evaluation.

Section II

Assessing the Infant

Optimal Breastfeeding: The Infant's Role

4

Introduction

Infants should be active participants in the breastfeeding relationship. Immediately after birth, the healthy newborn, preterm, and/or compromised babies not requiring immediate life-saving intervention should be placed skin-to-skin with the mother. After a period of 30 to 60 minutes many infants will use the stepping/crawling reflex to move to the breast, find the nipple, attach, and begin suckling, as shown in Figure 4–1. Newborn infants are capable of locating the nipple (probably because of the location of the mother's heartbeat and the fact that the secretions of the Montgomery glands smell similar to the familiar amniotic fluid), grasping the nipple, shaping it, and sucking. All healthy infants are awake, alert, and capable of initiating breastfeeding in the first hour after birth. For many infants, this period of alertness continues into the second hour after birth.

FIGURE 4–1
Newborn infant crawling up to the breast.

Used with permission. © Health Education Associates

Widstrom and colleagues (1993) have described a multistage progression of the infant's orientation to the breast in the first hour of life. This includes the following progression of activities:

Relaxation

Awakening

Activity

Crawling

Resting

Familiarization (licking and tasting)

Suckling

Sleeping

For later feedings, the infant signals the mother that it is time to feed. During the feeding, the infant's grasping, stretching, and stroking of the nipple (familiarization) stimulates the hormones that make and deliver milk. In addition, the infant transfers the milk from the breast to his or her mouth, forms the milk into a bolus, and swallows.

Active, integrated infants who are mature and coordinated still require the mother to be behaviorally and physiologically responsive in order to be optimally fed.

Gestational age and size

Infants are classified by gestational age and size. An infant's gestational age is helpful in determining general capabilities and expectations. All infants are individuals, however, and individual capabilities must be taken into account.

Gestational age

Assessment of gestational age determines approximate infant age since conception, so the assessment may be done during pregnancy or after the infant is born. Assessment of gestational age helps in understanding

- The appropriateness of other findings.
- Possible morbidities that are more common at various gestational ages.
- The infant's risk of death.

Prenatal determination of gestational age may be based on calculations using:

- The date of the mother's last menstrual period.
- The date of the first reported fetal activity (quickening usually occurs at around 16–18 weeks).
- The date of the first reported fetal heart sounds (usually 10–12 weeks, determined by Doppler examination).
- An ultrasound examination (before 20 weeks).

After the infant is born, gestational age is determined by physical and neurologic criteria, usually using The New Ballard Score (Ballard et al., 1991) or the Dubowitz assessment tool (Dubowitz et al., 1970).

Infants are classified by gestational age into three broad categories:

- Preterm: < 37 weeks gestation
- Term: ≥ 37 to < 42 weeks gestation
- Post-term: ≥ 42 weeks gestation

Gestational size

Infants are also classified by size; that is, the amount of growth in utero:

- Small for gestational age (SGA): The infant's birth weight is < 10th percentile for gestational age.
- Appropriate for gestational age (AGA): The infant's birth weight is between the 10th and 90th percentile for gestational age.
- Large for gestational age (LGA): The infant's birth weight is > 90th percentile for gestational age.
- Infants with birth weight under 2,500 grams are considered low birth weight (LBW).
- Infants with a birth weight under 1,500 grams are considered very low birth weight (VLBW).
- Infants with a birth weight at or under 1000 grams are considered extremely low birth weight (ELBW).
- Infants with a birth weight less than 800 grams are called micropreemies.

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Coordinated suck-swallow-breathe

Both breast- and bottle-feeding require the infant to coordinate his or her sucking, swallowing, and breathing reflexes. In general, the ability to coordinate sucking, swallowing, and breathing soon after birth correlates with the maturity of the infant. Premature infants should be assessed for the ability to coordinate the suck, swallow,

FIGURE 4–2
Deep sleep state.
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FIGURE 4–3
Rapid eye movement—light sleep state.
Used with permission. © Health Education Associates

breathe activity and have a functioning gag reflex before nursing at the breast. Oxygenation is better maintained during breastfeeding than during bottlefeeding, and there are fewer episodes of apnea while breastfeeding than when the same infant feeds from a bottle.

Coordination of the suck-swallow reflex is usually present by 32 to 34 weeks of gestation, although many infants do not develop a coordinated suck-swallow until 37 weeks gestation. Although it is quite variable, babies have been documented to transfer measurable amounts of milk as early as 28 weeks gestational age (Nyqvist, 1999). During breastfeeding, the nipple and a portion of the breast are drawn into the infant's mouth. The breast and nipple tissue forms a teat that completely fills the infant's open mouth. The nipple tip is drawn back toward the hard/soft palate junction while the tongue cups and compresses the breast and nipple tissue. This sucking action is coordinated with the infant's breathing and swallowing.

The gag reflex is normally present at birth. This protective reflex contracts the muscles of the soft palate in response to stimulation of the back of the tongue and soft palate.

Infant state

Infants move between six states of wakefulness, sleeping, and crying. Mature infants can transition gradually between states. Skin-to-skin holding facilitates transition from state to state.

- Deep sleep

  During the state of deep sleep (Figure 4–2), the infant exhibits no body movements, no rapid eye movement (REM, or fluttering of the eyeball visible under the eyelid), and breathing is quiet and regular. When infants are in the deep sleep state, they cannot be easily aroused and will feed poorly, if at all. Infants spend only 20 to 30 minutes in deep sleep before moving to light/active sleep.

- Light sleep or active sleep

  During the state of light sleep (Figure 4–3), the infant exhibits REM, body

FIGURE 4–4
Drowsy state—infant stretches.
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movements, irregular breathing patterns, and sporadic sucking movements. Infants spend most of their sleep time in this kind of sleep. The infant can move from light/active sleep to drowsy and quiet alert or into deeper sleep. When REM is seen, the infant can be brought to the breast and will usually feed well—even without opening its eyes or becoming more awake.

- Drowsy

  During the drowsy state (Figure 4–4), the infant may open and close its eyes, have increased body movements such as yawning and stretching, and make little sounds. Infants brought to the breast while in this state will usually feed well. The infant may become more alert and bright-eyed during the feeding.

- Quiet alert

  During the quiet alert state (Figure 4–5), the infant is interactive and responsive. The infant looks around, is bright-eyed, has smooth body movements, and even, regular breaths. Although this state is often recommended as the

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FIGURE 4–5
Quite alert state.
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FIGURE 4–6
Active alert state.
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best for breastfeeding, some infants may move too quickly from quiet alert into active alert and crying states before the feed begins. This may result in feeding problems.

- Active alert

  During the active alert state (Figure 4–6), the infant increases arm and leg movements, perhaps waving the limbs around. The infant may become fussy and move into the crying state or may move into the quiet alert state.

- Crying

  During the crying state (Figure 4–7), the young infant needs a comforting adult to aid in moving into a more organized state. A crying infant is difficult to orient to the breast for a feeding. Moving the infant to a more organized state prior to the feeding attempt will enhance the success of the feeding. Crying is a LATE sign of hunger (AAP, 2005). A fretful infant expends calories better reserved for growth, and an exhausted infant is less capable of feeding at the breast.

FIGURE 4–7
Crying state.
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Table 4–1 Common approach and avoidance behaviors in infants

	Common approach behaviors in infants	Common avoidance behaviors in infants (See Color Plate 4–1)
Face and mouth activities	• The infant's tongue repeatedly extends and relaxes.	• The infant spits up more than a passive drool, gags, or has nonsynchronized swallowing and breathing patterns.
	• The infant rounds its mouth and purses its lips.	• The infant grunts, indicating a bowel movement, retracts the lips, or grimaces.
Hand and arm activities	• The infant moves its hands onto its face or ears and holds them in place.	• The infant splays its fingers, extending its fingers with the fingers separated from each other.
	• The infant holds onto its mother's hand or finger.	• The infant fully extends its arms into the air together or singly.
	• The infant grasps its own hands or clutches its hands to the body.	
Leg and feet activities	• The infant folds its legs in a crossed position or places its feet sole to sole.	• The infant extends its legs into midair, either one at a time or together.
Body activities	• The infant curls its trunk, flexes its hips, and tucks its arms.	• The infant "airplanes" by extending the arms out to the side at shoulder level, the upper and lower arms may be at an angle to each other.
		• The infant may startle.
Visual activities	• The infant locks onto a person's face or other object and maintains a gaze.	• The infant actively averts its eyes, perhaps momentarily closing them.

Adapted from University of New York, Stony Brook, 1994.

Approach and avoidance signals

In addition to noting the infant's state, observing the infant's behaviors can indicate whether the infant is willing to be approached (approach behaviors) or if the infant needs help to become more organized (avoidance behaviors). (See Table 4–1.)

Feeding cues are specific approach behaviors

Approach behaviors signal the infant's desire for interaction on many levels. Feeding cues illustrate a specific approach behavior requesting nourishment (Figures 4–3, 4–4, 4–5, and 4–6):

- Mouthing and sucking. The mouth, lips, and jaws move in a searching or sucking motion. The mouthing behavior may be organized into sucks that can be directed to its own hands and fingers, the mother's fingers, or other objects. Sucking may occur in a searching motion involving head movements.
- Subtle body movements, wiggling, flexion of the body

- REM, or rapid eye movement, under the infant's closed eyelid
- Rooting or turning toward a cheek that is stroked or touched
- Moving hand to mouth, moving hands to the head and face

Energy

Breastfeeding uses less energy than does feeding from a bottle, even if the infant is premature. Sucking and swallowing at the breast is less stressful than the utilization of the oral motor skills required to do the feeding (Meier, 1988). However, breastfeeding does require the infant to be interactive. Infants who are well nourished feed best. Infants who do not have sufficient energy to feed become weaker, more apathetic, and may fail to thrive. Unfortunately, popular thinking may lead parents to believe that an infant who sleeps several hours, feeds briefly, and sleeps again is in a normal feeding pattern. An infant who meets this description is actually an infant who needs to consume more calories in order to feed actively, more efficiently, and more frequently.

Energy characteristics of normal term infants

- Normal heart rate is 100–180 beats per minute, usually 120–160 beats per minute when awake.
- Normal respiratory rate in the newborn is 30–60 breaths per minute.
- Heart and respiratory rates remain stable during breastfeeding.

Neuromuscular system

Several aspects of the neuromuscular system are involved in feeding. Major nerves that make feeding possible include all 12 cranial nerves.

Infant musculature involved in breastfeeding includes the following (Walker, 2002):

- Muscles of chewing and swallowing: temporalis, masseter, medial pterygoid, lateral pterygoid, buccinator, and orbicularis oris
- Muscles moving the tongue: genioglossus, styloglossus, stylohyoid, digastric, mylohyoid, hyoglossus, and geniohyoid
- Muscles moving the throat: sternohyoid, omohyoid, sternothyroid, and thyrohyoid

The intact infant has a functional neurologic and muscular system to assist in feeding at the breast, including the following:

- Rhythmic sucking
- Ability to place body in flexion at elbows, knees, and ankles, as shown in Color Plate 4–2
- Appropriate reaction to stimulation
- Ability to orient to the breast, concentrate, and work at feeding
- Ability to become more organized when soothed
- Intact suck reflex, gag reflex, and rooting reflex
- Ability to coordinate the suck-swallow-breathe pattern

The normal newborn is expected to breastfeed 8 to 12 times or more per 24 hours (AAP, 2005).

Normal characteristics of infants

When the infant is observed unswaddled and without contact in a quiet awake or light sleep state, the infant has the following characteristics:

- Moderate flexion of all four limbs
- Symmetry from side to side, including the face
- Motor activity appropriate for the physiological state
- Smooth, spontaneous movements

Desire

Ideally, the infant approaches the breast and works actively to achieve feeding. Infants are capable of long periods of concentration. If the infant is in the active alert, quiet alert, or drowsy state, it will work toward achieving the feeding especially if the feeding attempt is preceded by skin-to-skin contact with the mother's chest.

Orientation

Within minutes after birth, intact infants are able to orient to the breast and nipple to initiate feeding. Some infants need more time, but most are capable of feeding within the first 2 hours. Skin-to-skin contact provides a favorable beginning to breastfeeding and allows the infant an opportunity to organize his or her motor state, familiarize to the breast, hear its mother's heartbeat, smell the Montogomery gland secretions, and then begin to lick and suckle.

Infants who are held skin-to-skin experience stable thermoregulation and improvements in both respiratory status and behavioral states. Premature infants who are held skin-to-skin have improved physiologic stability and feeding tolerance (Nyqvist, 1997). Skin-to-skin contact increases milk production and facilitates the establishment and maintenance of breastfeeding for longer periods in NICU mothers and babies (Hurst, 1997). If the infant is stable during maternal skin-to-skin contact, and has no contraindications to immediate breastfeeding, he or she should be offered an attempt at nuzzling/feeding at the breast prior to transfer to the NICU. (See Color Plate 4–3.)

Coordination

Suck, swallow, and breathe are coordinated in the intact infant born after 37 weeks of gestation and may be coordinated as early as 28 weeks of gestation. Practice at the breast as well as skin-to-skin contact may accelerate the process (Nyqvist, 1999).

Muscle tone

Appropriate facial muscle tone is needed for the lips to form a seal at the breast, drop the jaw, and produce a strong suck. The muscular tongue cups the mother's nipple and breast tissue. Peristalsis of the tongue forms the milk into a bolus and moves it to the back of the mouth.

Gape

The wide-open gape occurs when the infant is moved away from the breast after smelling, licking, or touching the nipple. It is expected that the infant's mouth will open as wide during the gape as during a yawn. Gape is maximized when the head is tilted back so that the infant looks up at the mother's face.

Profile

When the infant is breastfeeding, its profile should show the chin indenting the breast. The nose may touch the breast or be very close. In order for the jaw to drop maximally, the infant's head should be supported but not pushed toward the breast. This can be achieved by the mother placing a supporting hand at the nape of the infant's neck and at the shoulders, rather than on the back of the head.

Seal

The infant forms a teat with the indrawn nipple and breast tissue. The infant creates and holds a seal with the lips and tongue so that the nipple remains in place during many minutes of suck-swallow-breathe action. The tongue should extend beyond the lower gum ridge, aiding the seal. Although the sound of swallowing may be noisy, clicking sounds are not associated with maintenance of the seal. Breast tissue is smooth at the junction of the lips and the breast.

Milk transfer

It is expected that breastfeeding infants will gain 1/2 to 1 ounce per day in the early weeks. Adequate weight gain is an excellent indication of milk transfer. Assessment of milk transfer at a single feed should include the following observations:

- Suck:swallow ratio of 2:1, or 1:1 is seen and heard in a repeating pattern during the feeding.
- Rocker motion of the lower jaw is noted, including ear movement during the deep sucks.
- Cheeks are rounded with no dimples or indrawing. No smacking or clicking sounds are heard.
- Before and after weights using a digital scale can be used to indicate the amount of the milk transfer. For a detailed description, see Appendix A.

Infant output

Infant urinary and stool output is also a good measure of milk intake. It is expected that the normal breastfed infant will

- Pass meconium (tarry black newborn stools) within the first 24 hours of life (Color Plate 4–4).
- Pass transitional stools (black transitioning to green, then brownish yellow) within the first days of life. Color Plate 4–5 shows transitional stool of a 4-day-old breastfed baby, with both meconium and breastmilk stool in one diaper.
- Have three to five urines and three to four stools per day by 3 to 5 days of age; and 4 to 6 urines and 3 to 4 stools per day by 5 to 7 days of age (AAP, 2005). See Color Plate 4–6 for appearance of normal stool by Day 5 of life.

Color

During the feed, the infant's color is maintained, oxygen saturation remains normal, and the heart rate is stable. The infant's energy level remains sufficient to achieve completion of the feeding.

Response

The infant appears comfortable at breast, relaxes during the feeding, detaches spontaneously, and appears satiated or full. The infant may want to feed again in only a few minutes. The mother should continue to watch for feeding cues and nurse the infant on cue.

Breastfeeding should be a pleasurable experience for both mother and infant. Optimal infant reactions to breastfeeding in the early weeks may include the following:

- Looking up at the mother
- Wrapping his or her arms around the breast
- Patting or massaging the breast
- Making cooing sounds
- Flailing his or her arms and legs and making rooting motions when close to the mother or anticipating a feeding

Signs of satiety include the following:

- Relaxed infant body posture, hands relaxed, toes curled
- "Milk drunk" expression; the infant smiles and rolls its head in a delighted way

5 Behavioral Assessment of the Infant in Relation to Suboptimal Breastfeeding

Introduction

If breastfeeding is not progressing optimally, the infant is at risk for malnutrition, dehydration, and other untoward consequences. Assessment of the infant should include skills required for breastfeeding, including the infant's

- State, especially the infant's ability to move smoothly from one state to another.
- Energy, especially the infant's ability to interact and sustain a feeding.
- Response to the feeding activity.
- Performance related to neuromuscular capacity and ability.
- Cueing related to signaling readiness to feed.
- Desire or interest in the feeding.
- Orientation to the breast, nipple, and feeding.
- Coordination of the skills related to feeding.

Assessment of infant state

Assessment of the infant's behavior is accomplished primarily through observation. An infant may make frequent transitions between states. Full-term infants are expected to do this smoothly.

Preterm, neurologically impaired, or underfed infants may change abruptly between sleep and wake states.

Maintaining or creating an organized state

The infant must be able to self-organize to breastfeed effectively. When interacting with the environment (the mother, the breast, suckling, diaper changing), a disorganized infant is unable to

- Console itself (usually achieved with hand-to-mouth movements).
- Be consoled easily (when held and soothed, for example).

If the infant cannot console him- or herself, a plan is required that seeks to assist the infant. Skin-to-skin care is an excellent way to achieve this. Other plans can include swaddling the infant and reducing stimuli (light, sound, and other stressors in the environment).

The disorganized infant will react to stimuli with the following reactions:

- Frantic movements
- Jittery movements
- Distressed sounds (coughing, screaming, crying)
- Color changes
- Irregular respiration
- Hypotonia; neurologically impaired infants generally have low muscle tone not only in reaction to stimuli

Talking, feeding, or caring for an infant with a low tolerance for stimuli may cause stress or fatigue; limitation of stimuli may improve feeding. Parents may need additional coping strategies and support.

- The premature or ill infant may be less likely to be able to maintain a state of organization.

Inability to maintain or regain a state of organization in an otherwise intact and seemingly mature infant may indicate impeding illness or an ominous physiologic change and should be evaluated promptly.

Infants who are excessively lethargic or extremely irritable should be referred for immediate medical evaluation.

Breastfeeding and the sleep states

Books for parents and health-care providers describe infants as sleeping as many as 22 hours a day. Without adequate information, parents may believe that sleeping infants should not be disturbed. A cycle of inadequate night and day feedings and lowered maternal milk supply may result. Although deep sleep is not an ideal state for breastfeeding, light or active sleep may be. Figure 5–1 shows a feeding cue that many parents may miss.

Infants in deep sleep should transition easily to light or active sleep, although the arousal may be brief before returning to deep sleep.

The majority of a newborn infant's sleep is in light or active sleep stages. Preterm infants spend more time in this state than do full-term infants. Full-term infants spend more time in the deep sleep and alert states than do premature infants.

Drowsiness is a transitional state in which the infants' eyes are heavily lidded, although they open and close. Although the infant's response to stimuli is delayed, he or she may be encouraged through gentle stimuli to move into a more alert state or, through soothing, to move back to a deeper sleep state. Infants may stretch, yawn, startle, and make little sounds in the drowsy state.

FIGURE 5–1
Infant demonstrates a feeding cue—sucking on its fist.
Used with permission. © Health Education Associates

Interview
Observe
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Lab tests
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Medical diagnosis
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Careful look
Compensation
Counseling

Offering an infant the breast during the light sleep or drowsy stages is an effective strategy for dealing with the infant who has a very quick transition from the deep sleep to active alert stages or crying.

The premature infant sleeps more total hours than a full-term infant and also wakes up more often than the full-term infant; the average sleep period for a premature infant is shorter than that for a full-term infant (Lang & Ballard, 1988).

Breastfeeding and the alert states

Quiet alert is the most interactive state for the infant. Full-term newborns have their first quiet alert state for the first 2 hours or so after birth. This is an ideal time to initiate skin-to-skin contact and for the infant to learn about breastfeeding.

Preterm infants may be unable to sustain a quiet alert state. Fixation on a stimulus or hyperalertness are characteristics of the preterm infant. In the quiet alert state, the infant may be unable to ignore the stimulus or to process more than one stimulus at a time. Another characteristic of the preterm infant is the exhibition of all of the characteristics of a quiet alert state except the ability to interact.

Infants in the quiet alert state will work continuously toward the goal of feeding. The mother who waits for crying as the cue to feed may have an infant who becomes easily frustrated and disorganized. Skin-to-skin contact, swaddling, decreasing environmental stimulation, and rocking, may calm the infant and allow a transition to quiet alert.

Active alert is characterized by increasing movements and increased sensitivity to stimuli. The infant does not pay attention in the same bright-eyed way that he or she does in the quiet alert state. Periods of fussiness and rapid or irregular breathing also characterize the active alert state.

The intact mature infant is able to be consoled during times of fussiness or may console itself. Preterm, ill, or impaired infants may be unable to self-console or respond to the soothing activities of the mother. An otherwise undiagnosed infant who is noted to be chronically or suddenly inconsolable requires prompt evaluation.

Crying is characterized by increased motor activity, color changes, and exaggerated response to unpleasant stimuli. Crying infants may console themselves by returning to a calmer state. Signs of stress in a crying infant include apnea, vomiting, and a decrease in oxygen saturation.

Very preterm, ill, or impaired infants may have a weak (or absent) cry. A chronically or suddenly weak cry should signal prompt, further evaluation.

Crying is a normal state for infants, but prolonged or inconsolable crying may be indicative of illness or a medical emergency. Further evaluation may be needed.

Crying that is defined as colic-like has the following characteristics:

- The infant is inconsolable.
- The infant cries without reasonable cause.
- The infant cries for more than 3 hours continuously a day.

To qualify as colic-like crying, the behavior must happen at least 3 days a week for at least 3 weeks as defined by Wessel (1954).

Counseling implications

Important counseling issues related to assessment of infant states include:

- Gaining an understanding of the mother's knowledge level regarding infant state transition and supplying information for any areas of deficit.
- Exploring options with the mother for maintaining close proximity to the infant so that the mother may observe the infant's transition through various states.
- Assisting the mother to understand that the infant's ability to transition through and maintain various states will change as the infant matures.
- Approach and avoidance behaviors in preterm infants.

Assessors should carefully observe premature infants for the following approach and avoidance behaviors:

Approach:

- Flexed arms, legs
- Feet braced against bedding
- Hand to face or mouth
- Relaxed muscle tone
- Calm sleep
- Adequate respiratory and heart rates, oxygen saturation, and skin color

Avoidance:

- Extends arms/legs
- Fingers splayed
- Eyes closed, squeezed
- Grimace, high muscle tone
- Crying
- Irregular respiratory rate with pauses
- Increased or decreased heart rate
- Decreased oxygen saturation
- Cyanosis

Assessment of an infant's energy to feed

Adequate intake of nourishment for energy is imperative for infants. Among other reasons, infants need sufficient energy to

- Grow.
- Develop.
- Feed.

A common misconception is that poorly feeding infants can be "starved" into becoming better feeders. Although breastfeeding requires less energy than does feeding from a bottle, infants who are calorically deprived become progressively apathetic at feeding. While infants should be followed on a growth chart by a pediatric care provider, a rough guideline is that all infants, including premature infants, should gain 1/2 pound to 1 pound per week in the early weeks.

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Lethargy or apathy related to feeding

Lethargy is abnormal in intact, full-term infants. It is important to differentiate possible reasons for lethargic or apathetic feeding before planning feeding strategies. The assessor must also clearly understand the reasons for the onset of apathy.

Lethargic feeders

- Fall asleep at the breast without transferring sufficient milk.
- Exhibit few feeding readiness cues.
- Sleep more than 2 to 3 hours consistently between feedings.
- Always feeds lethargically or feeds well under any particular conditions (upright, lying down, during the day, at night, in one position or another).
- Is jaundiced. See the yellow appearance of the infant's skin shown in Color Plate 5–1. Infants with high bilirubin levels appear very sleepy and may be unable to sustain energy for feeding.

  Visibly jaundiced infants should be referred for medical evaluation.
- Fed well at first but has become more apathetic as the days and hours have passed. Increasing apathy and muscle weakness can by a symptom of serious illness (e.g., meningitis, botulism).
- Has been exposed to drugs (e.g., labor and medication drugs, prescription or over-the-counter medications, illegal drugs) that may pass through the milk from the mother to the infant, resulting in lethargy or drowsiness.
- Is immature, with insufficient energy for feeding especially for many minutes.
- Has a congenital condition that requires more energy than the infant has been able to take in.
- Is malnourished due to previous poor feedings. In a failure-to-thrive infant, Vitamin D or zinc deficiency may be related to poor growth.
- Is dehydrated (may be due to poor feeding, diarrhea, or other illness or condition).

  Dehydration is associated with apathetic feeding and weight loss. Dehydrated infants require urgent medical attention.

  The following are symptoms of dehydration:

  - No urine in >8 hours.

- Dry skin and mucous membranes with poor turgor, such as the infant shown in Color Plate 5–2.
- Weak cry.
- Lethargy.
- Scant urinary output (urine may also be concentrated to dark yellow or orange) with few or no stools, including a prolonged duration of meconium if in the immediate week or two postpartum.
- Depressed fontanels, which may be a late and ominous sign of dehydration.
- Apathetic feeding at the breast, including falling asleep during the feeding, sleeping more than 2–3 hours between feeds, and being difficult to awaken.

Lethargic, malnourished, or underfed infants require adequate calories and hydration before they will breastfeed well.

Hyperactivity or irritability related to feeding

Hyperactivity or excessive irritability is abnormal in the healthy, full-term infant but may be seen in the preterm, sick, or neurologically impaired infant who has trouble transitioning smoothly between states and filtering stimuli. Signs of stress among these infants may include the following:

- Rapid change of state, from crying to deep sleep, for example, or from drowsy to hyperalert
- Color changes of the skin: blanching (whitening) or erythema (reddening)
- Vomiting
- Irregular respiration
- Changes in tone
- Bradycardia/apnea

Hyperactivity or increased irritability is abnormal and requires further evaluation. Suggested physiologic reasons of hyperactivity and/or irritability include:

- Hypoglycemia. Low blood sugar levels may cause infants to act jittery and disorganized at the breast.
- Exposure to drugs. Medications such as labor and medication drugs, prescription or over-the-counter medications, or illegal drugs may pass from mother to infant, resulting in hyperactivity and irritability.
- Reaction to a protein in the mother's diet (e.g., whey from cow's milk she has consumed).
- Congenital conditions such as a neurologic impairment.
- Prematurity.
- Pain, either current or remembered.
- Illness.

There also may be behavioral reasons for the infant becoming hyperactive and/or irritable before or during breastfeeding. For example:

- The infant may have pain related to the feeding position. Possible sources of pain include birth injuries resulting from forceps and vacuum extraction, cephalohematoma (swelling under the surface of the scalp), precipitous vaginal delivery, and fractured clavicle. The infant shown in Color Plate 5–3 has cephalohematoma, which may affect its ability to suck correctly.

- The infant experiencing tortocollis (stiff neck caused by spasmodic contractions of the neck muscles).
- The infant may be exhibiting oral aversion from remembered deep suctioning, diagnostic, or therapeutic procedures.
- The infant may be reacting to being forced onto the breast or being held in a forceful, tentative, or uncomfortable way.

Helping the infant to transition to active alert or quite alert by swaddling or letting the infant cuddle skin-to-skin with the mother may be helpful once the possible reasons for the irritability are discovered and appropriately handled.

Counseling implications

Important counseling issues relating to assessment of the infant's energy to feed include:

- Gaining an understanding of the mother's expectations of the infant's energy to feed.
- Assisting the mother to understand the infant's existing energy to feed.
- Exploring options with the mother to compensate for any suboptimal feeding energy displayed by the infant.
- Assuring that the infant is adequately nourished.
- Providing ongoing support and encouragement, relative to the degree of the infant's suboptimal capabilities, in an effort to achieve breastfeeding success for the mother-infant dyad.

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Assessment of infant's response to breastfeeding

The infant should feed to satiation, release the breast, and show signs of satisfaction. On occasion, the infant will initiate feeding, but not reach the point of satiation. Possible indicators of feeding problems related to the infant's response are discussed next.

Infant is unable to sustain the feeding

If the infant exhibits feeding cues, is in the appropriate state to feed, and latches on to the breast, but either falls asleep early in the feeding or lies passively at the breast, transfer of an adequate amount of milk is unlikely. When this behavior occurs repeatedly, possible reasons include the following:

- Malnutrition
- Dehydration
- Jaundice
- Prematurity
- An as-yet undiagnosed condition such as hypoglycemia or neurologic impairment
- A congenital condition such as short or tight lingual frenulum, cleft palate lip, etc.

- Poor positioning of the infant at the breast such that the nipple is not adequately stretched to facilitate let-down
- Inadequate flow of milk due to low supply of milk
- Infant is not hungry (must be verified by adequate weight gain if this is a chronic problem)

Estimation of breast milk intake with a digital scale can assist in determining the quantity of milk transferred. (See Appendix A.)

Infant acts fretful or discontented at the breast

If the infant exhibits feeding cues, is in the appropriate state to feed, latches on to the breast but fusses and frets rather than sucking, releases the breast, or stays passively in the nursing position, transfer of an adequate amount of milk is unlikely. Reasons for this behavior can include the following:

- Diaper change or other interruption between onset of feeding.
- Chronic underfeeding
- Lack of flow/diminished flow due to low milk supply and/or inhibited oxytocin response
- Poor positioning of the infant at the breast such that the nipple is not adequately stretched to facilitate let-down
- Malnutrition
- Reaction to too much milk or too forceful let-down for the infant (in this case, choking usually accompanies the fretting and baby has rapid weight gain)
- Infant is not hungry (must be verified by adequate weight gain if this is a chronic problem)
- Pain related with feeding (e.g., the infant with thrush—candida or yeast infection of the mouth)
- Impending or existing illness in the infant
- Immaturity
- Neurologic impairment
- Undiagnosed condition including maternal breast cancer
- Discomfort with the breastfeeding position due to womb position or birth trauma
- Infant preference for alternative feeding method

Early identification and intervention directed at decreasing fretful or discontented behavior may prevent more serious feeding problems.

Infant is unsatisfied after being removed from breast

The unsatisfied infant ends the feeding with clenched fists, furrowed brow, and fussiness and without transferring sufficient milk. Reasons may include the following:

- Improper latch such that effective feeding did not occur
- Low milk supply or milk flow
- Colic-like reaction to whey in mother's diet. It may occur 10 to 15 hours after the mother's ingestion of the whey.

- Premature ending of the feeding

There is a popular idea that infants transfer 90 percent of the milk in the first 4 or 5 minutes. Although this may be accurate for some infants, it may not be true for any particular infant. Feeding should have the goal of transferring sufficient milk to sustain the infant and should not be limited or directed by the clock.

Infant continues suckling—long feedings with low amounts of milk transfer

Long feedings (more than 30 minutes) may be an early sign of breastfeeding problems or may be characteristic of the mother and infant's breastfeeding style. In order to assess the milk transfer, check before and after weights with a precise digital scale with breast milk intake function (see Appendix A). Long feedings with low milk transfer may be due to the following:

- Insufficient amounts of milk available in the breast.
- Insufficient flow due to poor nipple stretching or other let-down inhibition
- Position of the infant at the breast
- Immaturity; some preterm and immature infants may require long resting times during the feeding. Limiting the duration of the feeding will compromise the amount of milk the infant receives. The feedings should increase in efficiency as the infant matures.
- Congenital anomaly of the infant such as cleft lip, palate, Trisomy 21 (Down Syndrome)

Breastfeeding sessions with a preterm, immature, or congenitally affected infant usually take considerably longer than sessions with other infants. Continued assessments and evaluations including frequent before and after weight checks and pediatric supervision should always be part of the treatment plan.

- Infant desires more physical contact than provided during feedings.

If the pattern developed by the mother and infant is such that the infant is held for breastfeedings and rarely otherwise, the infant will learn to continue feeding in order to maximize contact with the mother. Holding the infant skin-to-skin in between feedings or use of a sling may change this pattern. Continued assessment of milk transfer and weight gain is imperative.

Infant becomes a progressively more weak and apathetic feeder

The otherwise intact infant who, as the days go by, sleeps longer and deeper in between feedings and nurses listlessly with insufficient transfer is at risk for poor growth, malnutrition, and dehydration. Following are possible reasons for this progression:

- Inadequate supply of milk
- Inadequate flow of milk

Assess milk transfer by taking before and after weights using a precise scale with breast milk intake function. (See Appendix A.)

- Poor start at breastfeeding. An infant who is underfed for the first days after birth because of restrictive hospital routines may be too lethargic to catch up even when the milk supply becomes copious.

- Malnutrition
- Dehydration. Infants who are inadequately fed become poor feeders and increase their risk of malnutrition and dehydration.
- Undiagnosed condition

Progressive decline in the ability to feed or feeding performance may be the first sign of an as-yet undiagnosed condition. Further prompt medical evaluation by a diagnostician is imperative.

Infant refuses to feed

Evaluation of the infant who is reported to "refuse" to nurse should include a medical assessment of the infant. The infant should also be assessed while being offered the breast in a variety of positions and in a variety of settings. The assessment should include observation of the infant's state and energy level. Assess whether the infant is

- Unable to feed, or
- Refuses to feed.

Evaluate the possibilities such as lethargy or irritability. The infant who refuses to nurse may do so on one breast or both breasts, but typically a position can be found such that the infant will nurse well sometimes on at least one breast. The infant who consistently refuses to feed may be unable to feed.

It is important to assure adequate nutrition while assessing the feeding difficulty of an infant who refuses the breast. The initial problem of an infant who refuses the breast can become complicated with malnutrition, dehydration, apathy, and lethargy. An infant may refuse the breast for these reasons:

- The infant previously has been forcefully put to the breast (Widstrom & Thingstrom-Paulsson, 1993).
- The infant's womb position has limited the nursing positions that feel comfortable.
- The infant's birth injuries (bruising to head or neck, fractured clavicle, and so on) cause the infant to feel pain or discomfort when put to the breast.
- The infant's mother is uncomfortable physically or emotionally with breastfeeding and interprets this discomfort as the infant's refusal to feed.
- The infant's previous experiences with painful diagnostic or therapeutic mouth procedures have left it with oral aversive behavior.
- The infant has other symptoms of a diagnosed or yet-to-be-diagnosed neurological problem.
- The infant has a soft palate cleft or other mouth anomaly.
- The infant is blind or has another physical challenge that has not yet been diagnosed.
- The mother has low breast function.
- The mother has undiagnosed breast cancer—"Goldsmith's sign" (Goldsmith, 1974; Saber et al., 1996).

An infant that consistently refuses to nurse on one breast has been linked with breast cancer diagnosis in the mother in the 5 years following. If after a complete feeding evaluation and correction the baby continues to refuse the breast, then the mother should be referred for medical evaluation.

Counseling implications

Important counseling issues related to assessment of the infant's response to feeding include:

- Gaining an understanding of the mother's expectations of the infant's response to feeding.
- Assisting the mother to understand the infant's existing response to feeding.
- Offering options to the mother that may compensate for suboptimal feeding responses displayed by the infant.
- Assuring that the infant is adequately nourished.
- Providing ongoing support and encouragement, relative to the degree of suboptimal feeding response, in an effort to ensure breastfeeding success for this mother-infant dyad.

Assessment of infant's interactivity in relation to feeding

During a feeding the infant should be observed to

- Become increasingly relaxed. The hand changes from being clenched to being relaxed.
- Respond to changes in the flow of milk with a variety of sucking patterns.
- Transfer sufficient milk.
- End the feeding spontaneously.

The infant who is unable to achieve this level of interactivity may be

- Hyperactive
- Premature
- Lethargic
- Underfed

The infant's response during feeding

- How does the infant respond to the sight and smell of the breast?
- How does the infant respond to changes in milk flow?
- Is the infant able to reattach after losing the nipple?
- Has the infant transferred sufficient milk?

The observer should also consider the following:

- Whether the infant is being put to the breast in an inappropriate state
- Whether the infant has been exposed to drugs or medications
- Whether the infant has a diagnosed or undiagnosed congenital condition that affects its ability to interact with the environment

Infants who avert their gaze or never seek faces or objects in the alert states, lie passively at the breast, or have aversive behavior from the beginning of a feeding may have undiagnosed problems unrelated to breastfeeding or may be exhibiting early signs of malnutrition and/or dehydration. Further evaluation and pediatric supervision are imperative.

Performance related to the infant's neuromuscular capacity and ability

Impaired neurologic and/or muscular functioning impacts feeding. Impaired performance may be temporary or permanent. Infants may

- Have congenital anomalies affecting the neurological or muscular system.
- Have had birth trauma.
- Have had exposure to drugs or medications.
- Have had a central nervous system insult.
- Have had an unusual intra-uterine position.
- Have a systemic illness.

Assessment of feeding cues

The infant with temporary or permanent neuromuscular impairment or the underfed infant may not be able to manifest the expected feeding cues. Instead, the infant may consistently demonstrate avoidance behaviors such as the following:

- Gaze aversion
- Sneezing
- Yawning
- Hiccuping
- Vomiting
- Finger splaying
- Airplaning (arms held stiffly out to the side)
- Stiffening
- Unusual crying (high pitched, inconsolable, or weak)

The infant may

- Become hyperalert in reaction to his or her anticipation of the feeding.
- Fall into a deep sleep.

The neuromuscularly impaired infant may be unable to coordinate its rooting reflex with approaching the breast, or the rooting reflex may not be observed or observed only occasionally. Crying may be seen as the infant changes from one state to another, and the infant may be hypersensitive to "normal" stimuli such as noise and light.

Care should be taken to assure that breastfeeding takes place with a minimum of stimulation.

Feeding cues may be absent or so subtle that they are observed only with very close observation. This is often the case with certain congenital conditions such as Trisomy 21 (Down Syndrome).

The neuromuscularly impaired infant may also be disorganized such that placement at the breast evokes feeding cues rather than feeding behaviors. The infant may need extra skin-to-skin time prior to the feeding or familiarizing at the breast prior to nursing.

Does the infant respond to feeding cues initiated by the mother? The mother may stroke the infant gently and evenly on both sides of the head, progressing toward the lips. Gentle stroking around the lips may evoke lip smacking, mouth seeking, and other prefeeding behaviors.

Assessment of infant's desire to feed

Placing the neurologically or muscularly impaired infant at the breast may not initiate feeding behaviors, or the behaviors may be delayed. An infant who has had multiple mouth examinations or therapies may be averse to feeding. Desire may be muted by the following circumstances:

- Previous trauma especially involving the face and mouth
- Drug and medication effects
- A congenital condition such as Trisomy 21 (Down Syndrome)
- A delay in feeding, especially if the infant is also compromised in any way (for example, already underfed)
- Infection or impending illness

Lack of desire to feed may also be a sign of disorganization on the part of the infant. The infant's energy may be misplaced (sucking on hands or a pacifier) or the infant may fail to progress from the gape into suckling because of disorientation (inability to locate the nipple). Infants whose mothers have had epidural medications in labor are more likely to be disorganized when attempting to breastfeed (Sepkoski et al., 1992; Ransjo-Arvidson et al., 2001) and to receive formula supplementation in hospital (Baumgarder et al., 2003). Prolonged skin-to-skin care may help with motor and state organization.

Assessment of infant's physical symmetry

Occasionally, feeding problems are a symptom of neuromuscular conditions that are expressed in lack of physical symmetry. The infant may have experienced birth trauma that impacts its ability to coordinate the neuromuscular activities of feeding, such as Bell's palsy, or other conditions.

Observe the infant lying by itself on a table or mother's lap. Ask yourself the following questions:

- Do the sides of the infant's face appear symmetrical?
- Do any facial muscles appear to sag on one side of the face?
- When the infant grimaces, moves its mouth or lips, do both sides of the face respond to the same extent?
- Are the infant's arms and legs (limbs) in symmetrical position?
- Is the infant able to move both limbs?
- Does the infant show any distress when attempting to move limbs?

Assessment of infant's orientation to the breast

An infant who is unable to orient to the breast to feed needs to be assessed as

- Having appropriate motions, but is unable to achieve the goal of feeding. This may be related to maternal labor medications (Righard et al., 1990; Sepkoski et al., 1992).

Or

- Lacking appropriate motions to achieve the goal of feeding. This may be due to the following:

- Immaturity, prematurity
- Drugs or medications affecting the infant
- A congenital condition, diagnosed or undiagnosed

If the cause of the infant's lack of appropriate motions is known, interventions should be undertaken to compensate and achieve the most optimum feeding possible. If the infant is observed to lack appropriate motions and the infant's condition is undiagnosed, further medical evaluation is imperative.

Assessment of the infant's coordination in relation to breastfeeding

Inability to coordinate the suck-swallow-breathe activity of breastfeeding is associated with prematurity as well as neuromuscular impairment. The premature infant may not be permitted to attempt at-breast feedings until the suck-swallow-breathe is observed, although research indicates that prematurely born infants are capable of nutritive sucking and increasing their milk consumption at ≥ 28 weeks (Nyqvist, 2001). The uncoordinated infant may

- Choke or gag at the breast.
- Pull away to breathe.
- Suck but not swallow.
- Suck only when triggered by a swallow.

These behaviors may be related to the following:

- Immaturity or prematurity
- Medication effects
- A congenital condition diagnosed or as yet undiagnosed
- Birth trauma or asphyxia
- Bell's palsy

Assessment of the infant's muscle tone in relation to breastfeeding

Hypotonia, or low muscle tone, is the most consistent abnormality to be observed in the neonatal neurologic exam (Tappero & Honeyfield, 1996), so it is not surprising to find hypotonia among the population of breastfeeding infants (Color Plate 5–4). However, any generalized increase or decrease in tone is significant because it may indicate a central nervous system insult or a systemic illness.

It is imperative that the infant receives prompt medical evaluation if any increase or decrease in muscle tone is observed.

The hypotonic infant may

- Be premature or immature.
- Be malnourished.
- Be dehydrated.
- Be affected by drugs, medications, or maternal fever during labor.
- Have a diagnosed or undiagnosed congenital condition such as Trisomy 21 (Down Syndrome), cardiac anomaly, etc.
- Have had a central nervous system insult.
- Have a systemic illness such as infantile botulism, sepsis, etc.

The hypotonic infant is floppy, flaccid, and low-toned with a weak suck.The infant may have poor head control and be unable to latch onto the breast and maintain the latch without assistance. Swaddling the infant in a flexed position may be helpful. The infant may exhibit subtle or no feeding cues, requiring the mother to initiate the feeding with gentle stroking of the face and lips (Danner, 1992). Prolonged skin-to-skin may improve motor organization.

Hypertonicity, or high muscle tone, is a less common finding than hypotonia in the newborn period (Tappero & Honeyfield, 1996) (Color Plate 5–5). The infant with hypertonia may be seen as arching its back, maintaining a stiff posture. The hypertonic infant often

- Is easily over stimulated.
- Leans away from the mother rather than moving toward her warmth.
- Is difficult to comfort.

Hypertonicity may be associated with the following:

- Previous negative or painful experiences at the breast
- Neurologic damage
- Bacterial meningitis
- Severe hypoxic-ischemic brain damage
- Massive intraventricular hemorrhage
- Tetanus

The hypertonic infant responds to breastfeeding as too much stimulation. In addition to arching, it may become increasingly stressed at the contact. Mothers have successfully nursed hypertonic infants in low light, with very little noise, and with the only touching between the mother and infant being the infant's mouth to the mother's breast.

Infants who are noted to exhibit sustained or chronic high muscle tone should be referred for medical evaluation.

Counseling implications

Important issues related to the assessment of the infant's neuromuscular capacity and ability include:

- Gaining an understanding of the mother's expectations of the infant's breastfeeding performance.
- Assisting the mother to understand the infant's breastfeeding performance in relation to any existing suboptimal/or neuromuscular capacity and/or ability.
- Exploring options with the mother to compensate for the infant's suboptimal capacity and/or ability.
- Assuring that the infant is adequately nourished.
- Providing ongoing support and encouragement relative to the degree of the infant's suboptimal neuromuscular capacity and/or ability in an effort to ensure breastfeeding success for this mother-infant dyad.

Assessment of infant output

Infant urination and stooling patterns are indicators of the adequacy of milk transfer. After the first few days of life, it is expected that the young newborn will have a minimum of three stools and six urinations daily.

Infants producing less than three stools and/or six urinations daily should be evaluated immediately for adequacy of milk transfer.

Unusual urine

The breastfed infant's urine should not be concentrated. It should be light in color and copious in amount after the first few days. It should have a mild odor.

Brick-dust urine

- Appears in newborns as brick colored.
- Is associated with insufficient milk transfer and dehydration.
- Is indicative of uric acid crystals (Color Plate 5–6).
- Is sometimes mistaken for blood.

Brick dust urine indicates a need for a medical evaluation and/or a breastfeeding evaluation.

Concentrated urine

- Is dark in color.
- Has an ammonia odor.
- Is indicative of dehydration.

Concentrated urine is a sign of inadequate feeding. A medical evaluation of the infant, a breastfeeding evaluation, and an evaluation of the adequacy of the mother's milk supply are imperative. (See Appendix A.)

Unusual stools

Blood in the stools can occur for several reasons:

- The infant may be reacting to formula currently in the diet or given in the past.
- The infant may have anal fissures.
- The infant may be allergic/have a reaction to a protein the infant or mother has eaten (Patenaude et al., 2000).
- The infant may be bleeding internally.

Blood in the stools of a breastfed infant requires medical evaluation. Changes in the mother's diet may be helpful.

The breastfed infant rarely has diarrhea (however, normal breastfed infant stools are sometimes mistaken for diarrhea). A medical evaluation is imperative if diarrhea is suspected in a nursing infant.

Foul-smelling stools

The exclusively breastfed infant's stools are sweet-smelling. Foul-smelling stools are indicative of the need for a medical evaluation.

Greenish stools (Color Plate 5–7)

- Are related to insufficient stretching of the nipple during nursing, and so there is less oxytocin (Uvnas-Moberg, 1996).
- May be of concern if they do not disappear with improved breastfeeding technique.

Mucous stools should resolve in 24 to 48 hours with improved breastfeeding positioning or nipple stretching prior to and during nursing. If they continue, medical evaluation is imperative.

Frothy stools may be associated with diagnosed or as-yet undiagnosed congenital conditions. Medical evaluation of the infant is imperative if the stools are frothy.

Counseling implications

Important counseling issues related to assessment of the infant's output include

- Gaining an understanding of the mother's expectations of the infant's output.
- Supplying information to the mother to aid in her understanding of optimal infant output.

Section III

Assessing the Mother

Optimal Breastfeeding—The Mother's Role

6

Mammals have mammary glands

Human beings are mammals and, by definition, female mammals make milk for their infants. Knowing about the making of milk in the mammary glands and the delivery of milk in other species is fascinating, but of limited helpfulness in understanding human milk production or delivery. Kangaroos, for example, have two mammary glands, or "teats," (just like humans) but make two different milks simultaneously, one for the very immature, newly born infant in the pouch and another for the "toddler" who hops over to nurse. Domesticated mammals—dogs and cats—have rows of mammary glands. There is a vast difference between the physiologic production of milk for one or two offspring and the commercial production of animal milk, such as cow's milk. Therefore, management of lactation in dairy mammals is not directly applicable to a human mother and her infant.

All humans have mammary glands. Nipples are evident in infants at birth, as seen in Figure 6–1. In males, the mammary glands stop developing, while girls continue to develop during puberty under the influence of the hormones estrogen and progesterone.

During adolescence, the female breast develops from the nipple into the breast, forming first the main ducts, then the smaller ducts that end with the milk-producing cells called alveoli, as seen in Figure 6–2. With each menstrual cycle, shifts in hormonal balances result in further mammary development (Figure 6–3). The hormones present during pregnancy (specifically placental lactogen, prolactin, and chorionic gonadotropin) cause accelerated growth and maturity of the mammary glands. Figure 6–4 shows an example. The breast is thought to contain approximately nine of these duct networks, which are referred to as lobes (Ramsay et al., 2005). Each main duct has an opening in the nipple called the nipple pore.

For reference purposes, the breast is divided into four quadrants, as illustrated in Figure 6–5:

- Upper-outer quadrant
- Lower-outer quadrant

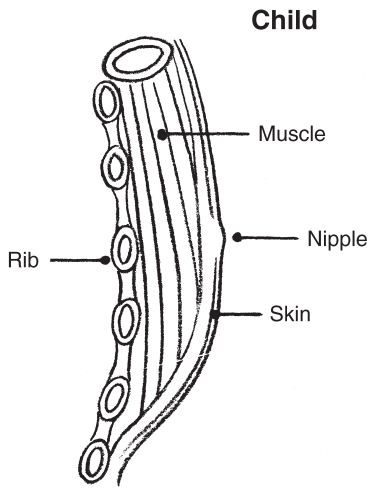

FIGURE 6–1
Child's breast.
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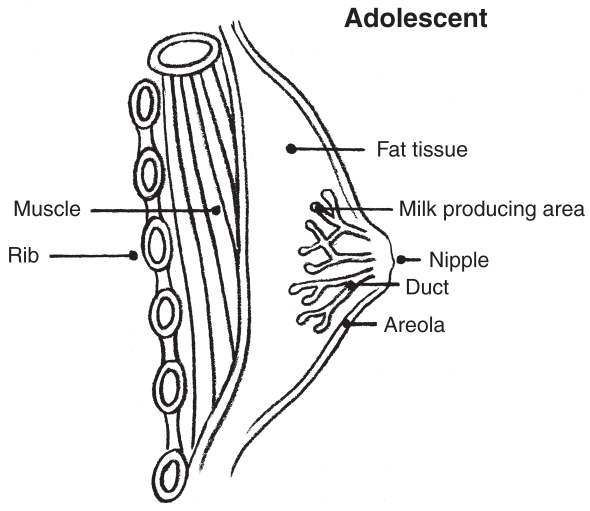

FIGURE 6–2
Developing adolescent breast.
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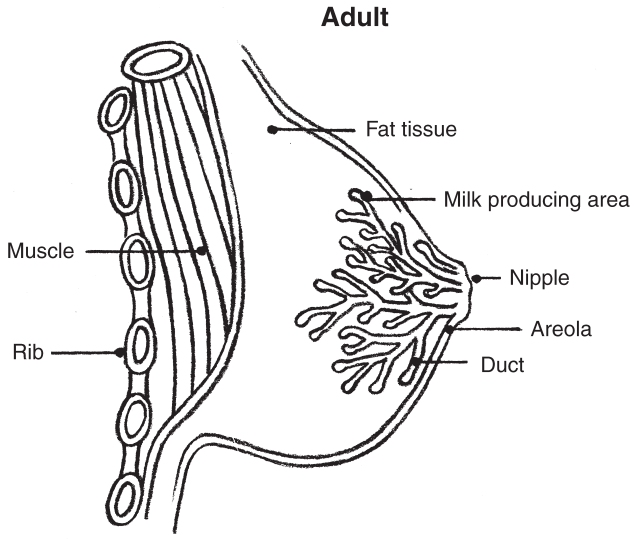

FIGURE 6–3
Adult breast.
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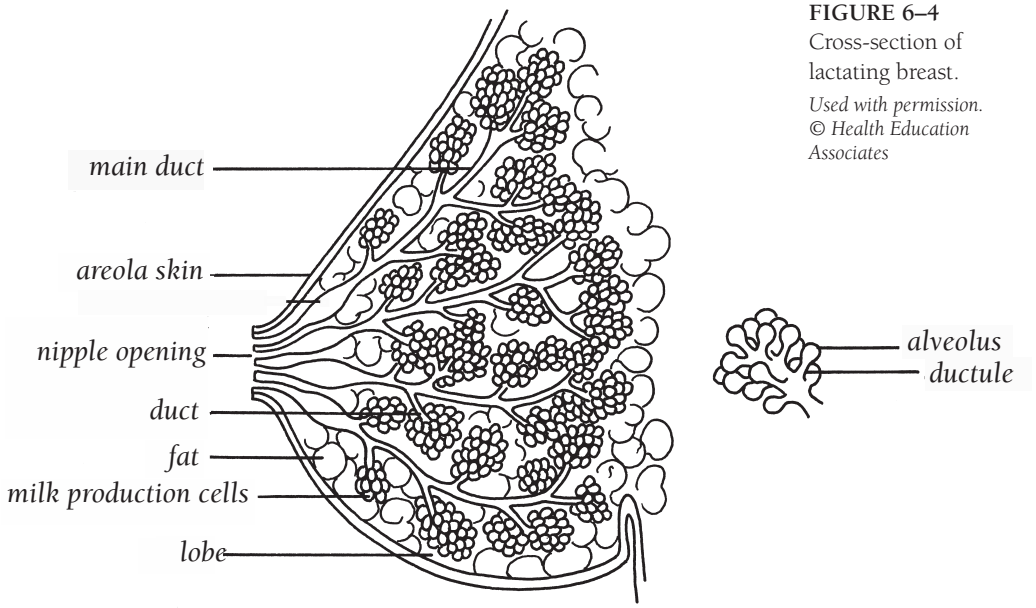

FIGURE 6–4
Cross-section of lactating breast.
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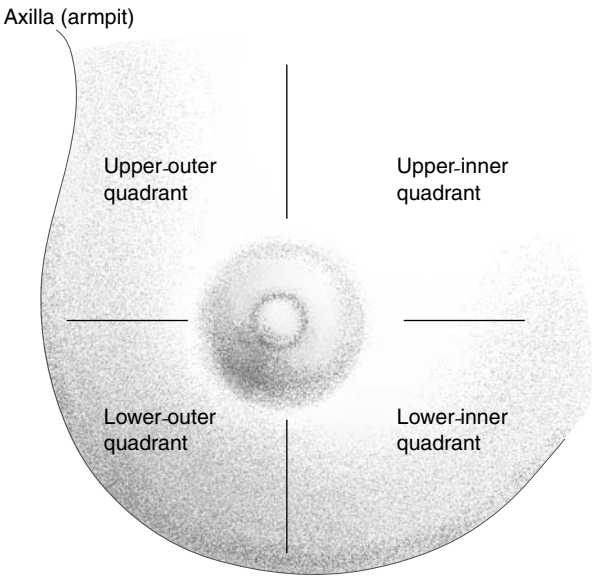

FIGURE 6–5
Quadrants of the breast.
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- Interview
- Observe
- Listen
- Lab tests
- Measure
- Medical diagnosis
- Medical history
- Notice
- Careful look
- Compensation
- Counseling

- Lower-inner quadrant
- Upper-inner quadrant

Functioning breasts and nipples

Breast size

Fat is distributed throughout the breast including around the milk producing cells and gives the breast its shape and size (Nickell & Skelton, 2005). The size charac-

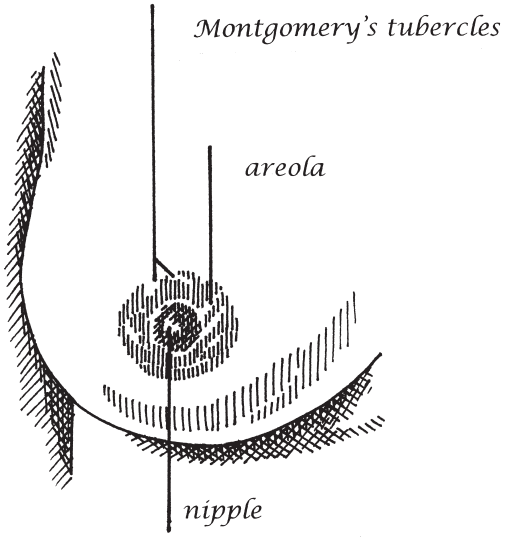

FIGURE 6–6
External anatomy of the breast.
Used with permission. © Healthy Children Project

teristics of the mature woman's breast vary from one woman to another, but the size of the breast is not related to the ability to produce sufficient milk for the infant.

Symmetrical breasts

A woman's breasts are never identical but optimally should be comparable in shape and size. The size and shape of each breast should be similar to the other.

Compressible breast tissue

The breast is optimally soft enough to conform to the shape of the infant's mouth during suckling. The infant's mouth is able to grasp the breast, form a teat, and remove milk.

Visible veins with an overall breast pattern

Preparation for lactation under the influence of the hormones of pregnancy includes an increase in the blood supply to the breasts resulting in observable (blue) veins that are patterned on both breasts. Color Plate 6–1 shows an example.

Intact, smooth epithelium on the breast

The breast surface, or epithelial layer, is normally smooth, as seen in Figure 6–6. The areola, a darker circle of skin, surrounds the nipple. Its size and coloration vary widely among women. Aside from nipples and Montgomery glands, optimally there should be no lumps or raised areas, nor should there be dimples. Stretch marks may be visible and normal.

Identify any scar or other marking on the breast and determine its cause.

Montgomery glands, or tubercles, on the areola

Montgomery's glands, or tubercles, are located around the nipple on the areola. Color Plate 6–2 shows very prominent Montgomery glands. These glands become larger and more noticeable during pregnancy. Women may describe them as "goose bumps." These

glands produce a unique fluid that is both antimicrobial and lubricating.

Evidences of secretion from the Montgomery glands are

- A sheen on the areola.
- The mother's report of water beading up on the skin of the areola and breast during bathing.

Montgomery gland secretion may be first noticed in late pregnancy, although the enlargement of the glands may be observed earlier in pregnancy.

Evenly pigmented, wrinkled nipple surface

Optimally, the nipple surface is evenly pigmented with no signs of redness, abrasion, fissures, cracks, blisters, blebs, pus, blood, or mucus. The nipple skin surface is wrinkled, having the potential to expand two to three times its resting length. There may be as many as nine nipple pores burrowed in the tip of the nipple. Mothers report several sprays during a feeding.

Presence of milk

Milk may be seen flowing from the mother's breast, collected in containers, and regurgitated by the infant. Milk may have a different appearance according to the stage of lactation but may also be colored by the mother's diet and drugs. Color Plate 6–3 compares the appearance of colostrum, mature breastmilk, and artificial infant milk (formula). The mother's milk should be appropriate for her state of lactation:

- Colostrum. Colostrum is produced under the influence of the hormones of lactation, appears mid-pregnancy, and continues to be secreted for 7 to 10 days after the infant is born, although it is mixed with copious amounts of mature milk beginning on the second or third day. Colostrum is yellowish or yellow-orange and thick.
- Transitional milk. Transitional milk is the milk that contains both colostrum and mature milk. This milk created by lactogenesis II, begins to appear around the second or third day postpartum. Copious in amount, it has the yellow, yellow orange, thick quality of colostrum and the whitish blue constituents of mature milk.
- Mature milk. Mature milk contains no colostrum. Mature milk appears thin and watery and is often whitish blue in color. Breastmilk may also assume other colors, due to vitamins or supplements in the mother's diet.

Patent milk ducts in the breast and nipple

Each milk duct network should terminate at the end of the nipple, allowing for the passage of milk from the milk-making cells, the alveoli, to the infant. Evidence of patent (open) milk ducts includes the following:

- Colostrum leakage during the last trimester of pregnancy (although a mother may have patent ducts and not leak colostrum)
- Ability to express droplets of milk with gentle hand massage (see Color Plate 6–4)
- Milk leaking between feedings during early lactation
- Milk spraying or leaking from the opposite breast during nursing in early lactation

- Milk transfer measured by an increase in infant weight taken before and after nursing

Appropriate lymphatic drainage

The lymph drainage of the breast can be quite extensive. About 97 percent of lymph flow is into the axillary nodes (Lawrence & Lawrence, 2005).

Evidence of innervation of the breast and nipple

The breasts are innervated by the fourth, fifth, and sixth intercostal nerves; the highly sensitive nipple and areola are primarily innervated by the fourth intercostal nerve. Stimulation of the nipple sends a message via the nerves to the pituitary to make and secrete hormones that work to produce and deliver milk. The stimulus of the warm, wet mouth of the infant results in optimal levels of prolactin, which stimulates the production of milk in the breast. Oxytocin, secreted in response to stimuli including nipple stretching and the infant's hands kneading the breast, triggers the delivery of the milk through a process called "let-down" or "milk ejection." The nipple is responsive to stimuli, touch, erecting in response to stroking, finger manipulation, cold, and/or sexual stimulation.

Removal of milk to maintain cellular integrity of milk-making cells

In response to frequent and rapid removal of milk, the alveolar cells produce more milk. Increased pressure on the milk-making cells changes the cell configuration so that less milk is made. (Infrequent milk removal results in engorgement or overfullness, which increases the pressure on the milk-making cells.) Cellular integrity is partially dependent on lack of pressure on the milk-making cells:

- Internally from sufficient and efficient milk removal (by baby or expression)
- Externally from nonrestrictive clothing such as the bra

Everted, tubular-shaped nipples

The everted nipple is stimulated during suckling and triggers an increase in the secretion of the hormone prolactin, which stimulates the milk-making cells to produce milk. The nipple is stretched far back into the infant's mouth and formed into a tubular shape. Nipple stretching causes the secretion of the hormone oxytocin, which in turn contracts the smooth muscle (myoepithelial) cells surrounding the milk-making (alveolar) cells.

Intact neuromuscular ability to position infant

The mother and infant work together to find the optimal position for breastfeeding, and the mother should be comfortable either sitting or lying down. The assessor should check for back strain or abnormal or uncomfortable wrist and limb positions. A footstool, pillow under the mother's elbow, and a cushion behind her back are often helpful. The position selected should allow for efficient milk transfer without nipple pain. The mother should be able to maintain the position for the feeding.

If the position of the infant is incorrect or painful, the mother should break the seal

either by inserting her clean finger in the corner of the infant's mouth or pressing gently against her breast.

If the infant loses the nipple during a feeding, the mother and infant may need to work to re-latch.

Maternal hormones optimally support lactation

In the postpartum period, lactation is achieved by a specific and unique combination of hormonal events.

- Pregnancy has prepared the breast for lactation through the influence of the primary hormones prolactin, estrogen, and progesterone. Colostrum is produced beginning in pregnancy; this is called "lactogenesis I."
- A rapid decline in progesterone and estrogen occurs with the complete delivery of the placenta. During pregnancy, progesterone binds to receptor sites in the breast, blocking prolactin from triggering the manufacture of mature milk. When progesterone levels fall after the placenta is delivered, lactogenisis II begins. Copious milk is secreted by the third day postpartum for both breastfeeding and non-breastfeeding mothers as a result of this hormonal change. Suckling in the early hours and days postpartum assures an adequate number of prolactin receptor sites are primed for optimal milk production (Livingstone, 1997). The milk is a combination of colostrum and mature milk—"transitional milk" for 7 to 10 days. Lactogenesis III is the ongoing production of milk supported by continued prolactin secretion with nipple stimulation and lack of pressure on the milk-making cells.
- A functioning oxytocin secretion occurs in response to nipple stretching (Uvnas-Moberg et al., 1996) and/or a stimulus response reaction triggered by the mother smelling, touching, hearing, remembering, or thinking about the infant. Some mothers are unaware of any of the signs below. Other mothers may misconstrue lack of strong sensations as a sign of inadequate milk. Evidence of oxytocin release may include the following:
  - The mother's report of a "tingling" sensation in the breasts
  - Milk leaking from the opposite breast when the infant is feeding
  - The mother's report of uterine cramping as the infant feeds
  - The infant's increased frequency of swallowing
  - Leakage of milk between feeds
  - The mother's feeling of well-being after a feeding

Figure 6–7 summarizes the pathway and roles of prolactin and oxytocin.

Other physiologic indicators

Normal levels of iron

Normal iron levels allow women to feel well mentally and physically and have well-oxygenated cells. Women with iron-deficiency anemia are at greater risk of recurrent mastitis and physiologic fatigue.

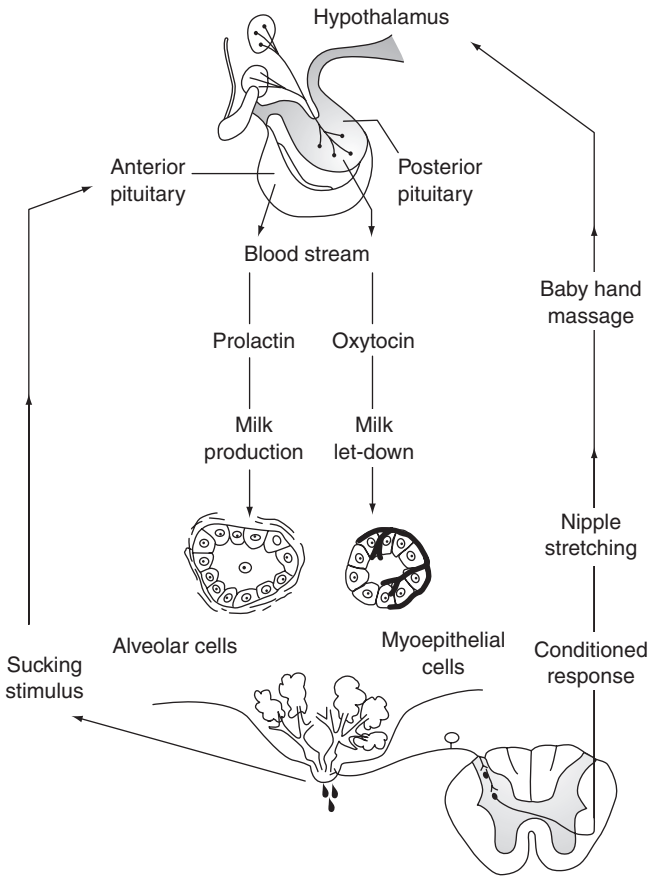

FIGURE 6–7
Prolactin and oxytocin.
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Normal levels of thyroid hormone

Normal thyroid levels are essential for adequate milk production. Both low and high thyroid levels have been associated with milk supply problems.

Normal uterine discharge

Uterine discharge after birth is an indicator of the healing of the uterus after birth. Pernoll (1991) states the predictable sequence expected:

- Lochia rubra is the blood-tinged uterine discharge post-delivery that includes shreds of tissue and decidua.
- Lochia serosa is the paler, clearer uterine discharge that is seen after a few days.
- Lochia alba normally appears in the second and third postpartum weeks. The discharge is thicker, mucoid, and yellowish, containing predominantly leukocytes and degenerated decidual cells.
- Lochial secretions cease as healing nears completion, usually by the fifth week.

Educational expectation of the mother

It is important for the mother (and the members of her support network) to understand the basic concepts of lactation:

- Formula feeding is less desirable both on public health and individual levels.

- Infants should be fed on cue, not by the clock, at least 8 to 12 times a day, at first.
- The mother should know how to make milk on an ongoing basis. The infant is expected to gain weight at a rate of ½ to 1 ounce per day and have frequent bowel movements and urination.
- Problems, including sleepy infants or poor feeders, as well as breast problems, should be investigated.
- Help is available if breastfeeding seems difficult, is painful, or if there are any problems. Mothers should be made aware of, and encouraged to seek out, community resources.

Behavioral expectations of the mother

It is expected that the mother will put her understanding of lactation into action. She is

- Able to offer the breast to the infant as needed. If this is not possible, the mother is able to remove milk by hand expression or pumping for later feeding.
- Willing to remove milk frequently and sufficiently.
- Able to respond appropriately to the infant.

Optimal maternal response to breastfeeding

The mother reports that she

- Feels only tugging or pulling at her breast during the feeding (no pain).
- Is confident in her continuing ability to make milk.
- Feels supported in her decision to breastfeed.
- Has a feeling of well-being, both emotional and physical.
- Enjoys breastfeeding, as seen in Figure 6–8.

FIGURE 6–8
Breastfeeding is an enjoyable experience for mother and baby.
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Interview
Observe
Listen
Lab tests
Measure
Medical diagnosis
Medical history
Notice
Careful look
Compensation
Counseling

7 Possible Anomalies Related to the Breastfeeding Mother

Assessment of the breasts

Size of breast

Size of the breast is proportionately unimportant relative to breast function. The milk storage capacity of the breast cannot be judged by the increase in breast size during pregnancy (Cregan & Hartmann, 1999). Essential considerations to be evaluated in an assessment include the following:

- Confirmation of functional milk-making tissue
- Patent ducts
- Appropriate innervation
- Frequent and efficient removal of milk

Gigantomastia of pregnancy is a rare, extreme breast overgrowth and has been reported, with breasts increasing in size up to 25 pounds each (VanHeerden et al., 1988). The cause of this massive growth of the breasts during pregnancy is unknown but thought to be hormonal and there are few reports of successful lactation with this condition (Lawrence & Lawrence, 2005).

Absence of breast changes during pregnancy

Increase in breast size occurs typically during pregnancy. However, some women do not experience these normal breast changes until the immediate postpartum period. If a mother reports no evidence of breast changes during either pregnancy or the im-

mediate postpartum period, breastfeeding should be monitored closely so that the infant does not become nutritionally compromised.

Absence of breast enlargement, breast tenderness, increased skin pigmentation of the areola, increased veining of the breasts, and/or enlargement of the Montgomery glands during pregnancy and immediate postpartum period may be of concern as indication of inadequate glandular tissue.

Absence of breast changes postpartum

Absence of leaking of milk and feelings of fullness as the mother's milk "comes in" (3 – 4 days postpartum) may be of concern regarding insufficient glandular tissue or inadequate progression from lactogenesis I to lactogenesis II.

Pediatric supervision of this mother's infant, including frequent weight checks, is vital.

One breast

It is possible to fully breastfeed an infant with only one optimally functioning breast. Only one functioning breast may be present congenitally (amastia), following injury or trauma, or following mastectomy or other significant unilateral breast surgery.

When a mother has had a partial or radical mastectomy on one breast, breastfeeding may be possible on the remaining, intact breast. Women who have had reconstructive surgery may have had functional breast tissue replaced with other prosthetic material. If the mother has had therapeutic doses of radiation, milk-making capacity may be severely diminished in the exposed breast. It is important to ask if either breast has been exposed to therapeutic doses of radiation.

During lactogenesis stage II, abundant milk may be produced in both breasts because of the hormonal changes of pregnancy and the delivery of the placenta. This does not mean that sufficient milk during ongoing milk production (lactogenesis III) will necessarily follow.

The mother may need to be taught comfort strategies if milk cannot flow out of the affected breast and the pressure becomes painful.

The infant of a mother with a nonfunctional breast will require frequent weight checks and close pediatric supervision because the other breast may not function optimally.

More than two breasts or nipples—polymastia: Accessory breasts or supernumerary breasts or nipples

Additional breast tissue and nipples may occur on the body along the "milk line" that extends from the axilla (armpit) to the groin. Figure 7–1 indicates the locations where accessory breast and/or nipple tissue has been identified. Small areas of accessory breast tissue may fill up with milk on the second or third day postpartum but, because these supernumerary breasts are rarely fully functional, there are usually no or few ducts that would enable the milk to exit. Milk pressure builds and eventually the tissue involutes or "dries up." Occasionally, what the mother thought was a mole is actually a supernumerary, or extra, nipple that increases in size during pregnancy and may or may not produce milk. The mother shown in Color Plate 7–1 has a supernumerary nipple on her left areola that did not interfere with latch-on, suck, or breastfeeding.

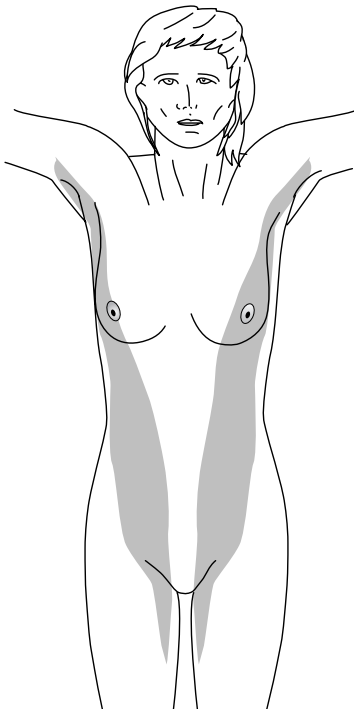


FIGURE 7–1 Shaded area indicates possible locations of accessory breast and/or nipple tissue.

Interview
Observe
Listen
Lab test
Measure
Medical diagnosis
Medical history
Notice
Careful look
Compensation
Counseling

Asymmetrical breasts associated with inadequate glandular tissue

Breasts are usually slightly asymmetrical (different in size and shape), but markedly asymmetrical breasts are always cause for close follow-up. Infants of such mothers should have frequent weight checks (Huggins, 2000; Neifert, 1985). Asymmetrical breasts, such as those shown in Color Plate 7–2, may indicate that there is also insufficient glandular tissue, although there are reports of mothers who have markedly asymmetrical breasts that produce adequate milk.

Of increased concern are mothers with asymmetrical breasts that appear tubular in shape and/or the mother's report of no breast changes during pregnancy or in the immediate postpartum period. Asymmetrical breasts may be congenital or a result of trauma, radiation therapy, insertion of a chest tube in infancy, or preadolescent breast surgery such as biopsy.

Underdeveloped breasts (micromastia)

Abnormally small, immature-looking breasts may indicate lack of glandular tissue or hormonal imbalance.

Infants whose mother's breasts are observed to be markedly underdeveloped require frequent weight checks and close pediatric follow-up.

Scars and marks on the breast

The presence of any visible marks on the breast indicates the need to determine their cause. Causes of such marks may include the following:

- Indentation marks from
  - Tight bra or other restrictive clothing, as shown in Color Plate 7–3

- Breast shells, nipple shields, pump flanges, or other equipment (see Color Plate 7–4)

External compression of the breast is related to an increased chance of breast problems.

- Scars from
  - Breast reduction surgery
  - Breast augmentation surgery
  - Breast biopsy and surgery
  - Past trauma to the breast
- Bruising or abrasion from ongoing trauma from
  - Incorrect breastfeeding positioning and attachment, as shown in Color Plate 7–5
  - Misuse of pump (e.g., pulling the flange off of the breast before turning off the pump, using a nonautomatic pump without appropriate suction breaks, etc.)
  - Other trauma to chest (e.g., blows to the chest from sports injury or car accident, etc.)
- Signs of inflammation, infection, or abscess

Rigid or noncompressible areola and breast—Generalized hardness

For the infant to effectively draw the nipple and breast tissue into his or her mouth, the area of the breast behind the nipple should be soft and pliable enough to compress into the infant's mouth. Care should be taken to relieve any breast fullness—pressure on the milk-making cells can reduce the quantity of milk produced.

- A rigid or noncompressible breast or areola may be related to
- Unilateral or bilateral engorgement due to inadequate removal of milk. This may be observed from the 2nd to the 10th day postpartum and is usually minimized by adequate, frequent feedings in the early days. Breast engorgement is characterized by generalized hardness of the breast, even extending into the Tail of Spence (breast tissue extending into the axilla or armpit area). The skin may be warm or hot to the touch and distended to the point of shininess. The mother may have a temperature above normal and feel uncomfortable.
- Unilateral or bilateral engorgement due to missed feedings. This may be observed any time after the second day postpartum and may be aggravated by inadequate milk removal. It may also be observed at other times when feedings or milk expression sessions are missed.

Gentle handling of the breasts is important. Soaking the breasts in a basin of warm water and hand expressing gently may be a helpful early strategy. Some mothers also find a warm shower to be soothing. Breast pumping with high suction should be avoided until the milk is flowing. The best relief after the hard area has softened is a well-positioned nursing infant.

- Bilateral fullness of the breast. This may occur in early lactation (days 2–4) and later in lactation if feedings are missed (such as when the infant first sleeps through the night).

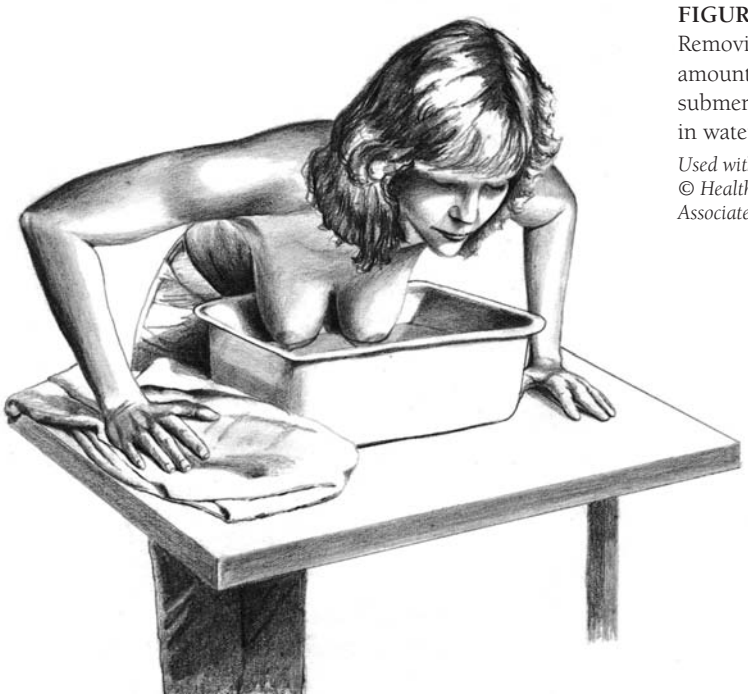


FIGURE 7–2
Removing a small amount of milk by submerging breasts in water.
Used with permission. © Health Education Associates

- Bilateral or unilateral fullness of the breast due to inadequate drainage of the lymphatic system (this is rare).

Removing a small amount of milk via submersion of breasts in water, as seen in Figure 7–2, by expression may make the areola softer and the breast and nipple more available for the infant. Inadequate drainage of lymph may be secondary to lymphatic system blockage in the axilla. If milk removal does not soften the breast and areolar area, a medical assessment is recommended.

- Unilateral or bilateral fullness or engorgement secondary to breast implants, biopsy, or other trauma restricting the flow of milk. Color Plate 7–6 shows breasts with implants: The right breast is functioning normally in spite of the implant. The left breast is painfully engorged secondary to the implant impeding/blocking milk flow. Inspection of the breast for visible signs of breast surgery should always be part of the assessment; however, the mother should also be questioned about surgery involving the breast because an augmentation scar may be hidden in her armpit, navel, or under the heaviness of her breast. The most candid answers will be given if the questions related to elective breast surgery are asked in private. Family members and partners may be unaware of the surgery.

The breasts may have been augmented using a variety of procedures with a range of effects on breastfeeding and human lactation:

- The incision may have been made under the breast and the implant placed under the breast tissue. The scar is visible when the breast is lifted.
- The incision may have been made anywhere on the breast. Scarring from incision can be seen in Color Plate 7–6.
- The incision may have been made around the areola-nipple area (periareolar incision). The scar is usually visible at the margin of the pigment change

along the edge of the areola. Of concern with this surgical technique is that the ducts leading to the nipple and nerves innervating the nipple may have been severed. This procedure has been shown to have the greatest negative effect on breastfeeding (Hurst, 1996). This incision may also be indicative of breast reduction surgery.

- The incision may have been made across the areola-nipple area. This procedure is disruptive to lactation because the ducts, nerves, and blood supply may be negatively altered.
- The incision may have been made in the axilla. The scar may not be visible except on very close inspection. This procedure is less likely to have impact on the ducts, nerves, and blood supply.
- The incision can be made in the umbilicus and the implant threaded up to the breast. The scar may be visible only with very close inspection.

Implants may decrease the space available for milk in the breast, put pressure on the milk-making cells, and therefore decrease the quantity of milk, as well as the possible damage of the surgical technique. Increased feeding frequency should be encouraged to relieve pressure. The mother should be cautioned against further constriction of the breast by a too tight bra, for example.

Infants of mothers with breast implants should have frequent weight checks with a digital scale and close pediatric follow-up (see Appendix A).

- Inelastic skin. Surgical scars, trauma, and burns may contribute to lack of skin elasticity. This may make it difficult for the infant to latch on to the breast.

Mothers with inelastic skin should feed their infants regularly to avoid breast fullness, which would further compress the milk-making cells. Comfort measures such as soaking the breasts and hand expression or pumping may be helpful.

If the skin is not pliable enough, pressure on the milk-making cells may diminish the milk supply. Frequent feeding and/or expression is imperative.

Raised or hard areas of the breast—lumps

Any mass detected in the breast during lactation requires prompt evaluation.If the mass does not respond in one or two days to treatments such as increased nursing and removal of possible causes of duct blockage, further investigation by a physician is mandatory. With the sophisticated diagnostic techniques available, suppression of lactation is not necessary during diagnostic work-up.

Reasons for hardened or lumpy areas in the breast may include the following:

- Normal condition of lactating breasts. Lactating breasts are lumpy compared to non-lactating breasts, but the position of a normal lump generally shifts from nursing to nursing and from day to day.

Nursing more frequently, changing the position of the infant at the breast, improving the effectiveness of the feedings, and massaging the affected area gently should improve milk drainage.

- Plugged duct or clog. A plugged duct or clog is a localized breast problem that presents as a hardened area of the breast, without redness or other flu-like systemic symptoms such as fever or malaise. The area may be tender to

the touch. Once the area is drained of milk, normal function returns. Plugged ducts or clogs may be related to the following circumstances:

- Full milk-making cells and ducts that don't drain sufficiently because of poor positioning or inadequate suckling
- Blockage of ducts by cells that have been shed
- Inadequate milk removal because of hurried or infrequent feedings
- Poor-fitting bra (Color Plate 7–7), pressure from an underwire or other pressure on the area of the breast such as a bunched nightgown

A clog or plugged duct should respond to improved suckling and milk removal. Many mothers report that light breast massage and positioning the infant's chin toward the clog during feeding improves the flow of milk.

A physician should examine any clog that does not respond to interventions in 24 to 48 hours. Ultrasound or stereotactic imaging are helpful in diagnosing lumps in the breast.

- Abscess or localized collection of pus that is the result of a disintegration of tissue. The abscessed area in the left breast is clearly visible in Color Plate 7–8. An abscess is palpated as a hardened area of the breast that does not move or disappear with increased or improved nursing. The hardened area may be noticed in conjunction with mastitis and there may be a reddened area of skin over the location of the hardened area. Mothers with abscess usually present with systemic symptoms (fever, chills, malaise, aching).

An abscess must drain; it will not resolve in any other way. Drainage may occur by surgery, or by rupture into the duct system, causing the pus to mix with milk or by rupture to the outside. Small abscesses may be drained by fine needle aspiration or larger ones by lancing.

Weaning is rarely indicated in the case of abscess. However, it may be necessary to discontinue breastfeeding temporarily on the affected breast because the location of the abscess is too close to the position of the baby's mouth during feeding. During this time, lactation may be maintained by hand expression or by pumping the affected breast. Breastfeeding can continue on the unaffected breast. Systemic antibiotic therapy is also part of the treatment plan.

- Galactocele or milk retention cyst. This hardened area of the breast may be due to milk that has been produced, but for some unknown reason, does not flow from the breast. At first the cyst will be milk-filled. Eventually, because of fluid absorption, the galactocele will contain a more cheesy substance. Ultrasound will show that the galactocele has a similar appearance to milk. Galactoceles may be drained for diagnosis and for mother's comfort; however, breastfeeding with a galactocele is not contraindicated.
- Fibrocystic changes of the breast. These palpable lumps in the breast are common in women during their childbearing years. Thought to be due to reactions in the mammary tissue to hormonal shifts during the menstrual cycle, the lumps generally lessen with pregnancy. Symptoms include pain, tenderness, and nodules of varying sizes. Diagnostic procedures include palpation of a lump that moves freely, mammography, and needle aspiration biopsy. Fibrocystic changes are not contraindications for breastfeeding.
- Breast cancer. Pregnant and lactating women may develop breast cancer. It is recommended that a physician undertake a thorough investigation of a breast mass if

- The area shows no decrease in size after 72 hours of treatment.
- There are mastitis-like symptoms (without fever) that are not resolved after a course of antibiotic therapy.
- There is recurrent mastitis-like hardness reappearing at the same location in the breast (Petok, 1995).
- The shape of the breast or nipple is distorted. Color Plate 7–9 shows the right nipple pulling off center secondary to breast cancer.

- Additional reasons for lumps. There may be other reasons for lumps in the breast that are unrelated to lactation:
  - Breast cysts, which are firm, smooth, freely movable masses
  - Fat necrosis caused by the local destruction of fat cells
  - Lipomas, which are soft, well delineated, and freely movable
  - Hematomas, which occur as a result of trauma (Color Plate 7–10)

  Each of these conditions has a unique appearance during radiographic diagnostic procedures and usually does not impact breastfeeding.
- Hardened areas of the breast radiating from the areola. When milk is made but cannot exit the breast via the nipple pore, the retained milk may take the shape of the ducts and ductules and creates an enlarged area of the breast. This may be a result of the following:
  - A surgical procedure that has cut through ducts in the nipple area during a biopsy, lumpectomy, or lancing of an abscess
  - A congenital condition such as a galactocele or ectopic ducts that causes the milk-making cells and ducts to be separated from the nipple pores
  - Surgery that separates the nipple from the breast in breast reduction or impacts innervation of the nipple as in augmentation procedure, as shown in Color Plate 7–11
  - A burn around the nipple area that has left scar tissue, blocking the nipple pore
  - Other trauma
  - A bleb, or white dot, usually solitary, on the end of the nipple indicates a duct that is not draining sufficiently. The mother may be in considerable pain, which she describes as "pinpoint pain." Note that the bleb in Color Plate 7– 12 follows the injury in Color Plate 7–10. Color Plate 7–13 shows the bleb in profile.

  Blebs often keep reforming even after successful removal. Rarely, the bleb will disappear with active suckling or pumping. Mothers have used warm water soaks and gentle compression to push out the bleb from behind. A health care provider may use a sterile needle to open the bleb. Color Plates 7–14 and 7–15 show the bleb immediately and 5 minutes post lancing procedure.

No visible veins or atypical pattern of veins on the breast

Lack of visible veins or an atypical pattern of veins on the breast at the end of pregnancy and early lactation may indicate a lack of hormonal response in the breast, as

would be expected as a normal change of pregnancy. Insufficient development of milk-making tissue may be suspected, especially if the breasts are also asymmetrical.

If the breast has not responded to the hormones of pregnancy by increasing the blood supply, there is concern that the hormonal pathway may be compromised. Milk production may be diminished.

An atypical pattern of veins on the breast

- May be normal.
- May indicate tumor growth or other pathology.
- May be related to inadequate development of glandular tissue.
- May be related to past trauma to the breast, including surgery such as breast reduction surgery.

An atypical vein pattern should be assessed medically. Breastfeeding infants of mothers with atypical vein patterns should have frequent weight checks and close pediatric supervision.

Enlarged Montgomery glands

Enlarged Montgomery glands may be

- A normal response to pregnancy and lactation (see Color Plate 6–2).
- Injured by the trauma of poor latch, or the rubbing or pressure of gadgets such as breast shells, nipple shields, or pump flanges.

  Removal of the irritant is necessary.
- Infected.

  Antibiotic therapy may be indicated.

  A herpes lesion on the breast or areola may be described by the mother vaguely as a "sore" and may be mistaken for an infected Montgomery gland. Herpes lesions are painful and blister-like. Culturing the lesion assists differential diagnosis. Herpes on the breasts or nipple are a contraindication to breastfeeding until the lesion heals. Herpes can be life threatening for the infant.

Blisters on the breast or areola

Blisters may be related to a variety of factors:

- Herpes simplex virus (Color Plate 7–16)

  Herpes on the breast and areola is a contraindication to breastfeeding. Herpes may be transmitted from the mother's breast to the neonate during breastfeeding with deadly results. Culturing the lesion is necessary to diagnose HSV. If there is any question about whether the sore is an infected Montgomery gland or an HSV lesion in the early weeks postpartum, differential diagnosis is imperative because herpes can be life threatening to infants.

  Herpes lesions on other parts of the body do not contraindicate breastfeeding; however, they should be covered and every precaution should be taken to avoid the spread of HSV to the vulnerable infant.
- Poor positioning of the infant at the breast

  Irritation to the poorly positioned nipple can cause blisters filled with clear

fluid. Improving the position of the infant at the breast will minimize the trauma to the nipple skin. The infant may develop a blister on his or her lip for the same reason.

- Poison ivy or other skin condition for which the mother should seek medical therapy

  Poison ivy can occur anywhere on the body that has been in contact with the poison ivy toxin, including the breast. Although there is no danger to the infant from nursing if the mother has poison ivy on her breasts and areola, there is concern that the infant could contribute to a secondary infection on the mother's breast or areola through contact with the already damaged skin. The contents of the poison ivy blisters do not spread the disease.

Breast redness—inflammation

A reddened area of the breast is often indicative of breast inflammation or mastitis. Mastitis can be infective or noninfective.

Because the symptoms of infective and noninfective mastitis are similar, antibiotics and anti inflammantory fever reducing drugs are often prescribed for both types. Breast inflammation can be unilateral or bilateral.

Unilateral infective mastitis (Color Plate 7–17) is generally thought to be *Staphylococcus aureus*, although organisms such as *Escherichia coli*, *Bacteriode* species, and rarely *Mycobacterium tuberculosis* and *Candida albicans* have been cultured.

Bilateral infective mastitis is rare, is generally thought to be group *A streptococci*, and may be life threatening.

A medical doctor should see patients with bilateral mastitis urgently. Suspected bilateral mastitis is a medical emergency.

The mother should be instructed to take the full dose of the antibiotic even after symptoms are resolved.

Recurrent mastitis may be related to the following conditions:

- Anemia

  The mother with unilateral infective mastitis should be treated with antibiotics, encouraged to breastfeed frequently, and care for herself with rest, plenty of fluids, and fever reduction as needed.

  Mothers with recurrent mastitis should be examined by a physician for low blood iron.

- Inadequate or noncompliant use of antibiotics

Fetherston (1998) indicates that unilateral infective mastitis may be related to the following:

- A cracked nipple (by which the organism can travel into the breast; may cause the mother so much pain that she is reluctant to remove milk from that breast frequently or sufficiently)
- Nipple misshapen after a feeding
- Inadequate milk transfer, hurried feeds, or engorgement
- Infrequent feedings
- Plugged duct that did not resolve properly
- Short frenulum of the infant

- Use of plastic shells, nipple shield, or tea strainers on the breast
- Constricting clothing or tight bra

The mother also reports flu-like symptoms. Her breasts feel hot and are tender. The mother's breasts are reddened.

Comfort measures for the woman include keeping the milk flowing and the infant nursing as much as possible.

Mastitis is not a contraindication for breastfeeding.

Paget's Disease of the Breast

This is a very rare form of breast cancer. Symptoms include redness, scaling, itching of nipple and areola surface. Lawrence and Lawrence (2005) report that Paget's disease has been mistaken for candidiasis, indicating a need for close investigation of nonresolving or extreme yeast symptoms.

Misplaced duct openings

Nipple pores are occasionally found in other locations besides the nipple tip, such as along the shank of the nipple, on the areola (may look at first like a Montgomery gland), or rarely on the breast. The ductal system is otherwise normal. Mothers report considerable leaking from these pores.

No visible Montgomery glands, no sign of Montgomery gland secretion

Montgomery glands become more prominent in pregnancy and begin secretion of a glossy fluid that is both lubricating and antimicrobial. Montgomery gland secretion can be seen as one signal that the hormones of pregnancy are preparing the breasts for lactation.

If the Montgomery glands do not develop and/or there is no glossy sheen on the areola, especially in combination with an atypical vein pattern and lack of increase in breast size, frequent weight checks and close pediatric supervision of the breastfeeding infant is warranted.

Hair on the areola

There is no indication to remove hair growing on the breast or areola. There is a wide variation in the amount of hair, texture, color, etc. Hair on the areola should not impact breastfeeding. Occasionally a hair follicle may become infected. Hair removal on the breast during lactation may open the follicles to a secondary infection.

Rash on the breast or areola

Rash on the breast is often contact dermatitis (Color Plate 7–18), caused by irritating substances in contact with the skin.

Although usually caused by local irritants, a healthcare provider should closely follow any rash on the breast or areola.

The condition may be painful during feeding, between feedings, or both. Careful questioning of the mother should include asking about possible irritants, such as the following:

Interview
Observe
Listen
Lab test
Measure
Medical diagnosis
Medical history
Notice
Careful look
Compensation
Counseling

- Creams, salves, lotions, soaps, or other preparations she might have applied to the area
- Gadgets (breast pump flanges, shields, shells, and so on) she might have been using, and her cleaning techniques for these items (Color Plate 7–19)
- Bra pads that contain plastic or leaking devices she may have worn in her bra
- Cleaning techniques used for her bra or washable bra pads
- Changes to her routine that may have precipitated the skin reaction (wearing a bathing suit for hours a day, for example)
- Contagious skin problems on her body or in the family

Any suspected irritants should be removed from the mother's routine. Infection should be treated.

Common causes of breast and areola rashes include:

- Eczema and atopic dermatitis. Eczema or atopic dermatitis is a red, dry rash wherein the skin flakes off like "oily potato chips." The mother will report a burning or itching type of soreness not related to the actual breastfeeding. Discovery of the irritant and its removal are necessary before the condition will resolve.
- Impetigo—bacterial dermatitis. Impetigo can begin as a concentrated area of redness and progress to itchy vesicles, erosions, and honey-colored crusts. Impetigo is highly contagious and is spread by contact from the lesions. The mother must seek medical care and be treated. The infant should be checked daily for lesions and treated rapidly, especially if the infant is less than 3 months of age.
- Hives. These very itchy wheals, or raised areas, may be caused by contact with or ingestion of an allergic substance or food. Prescribers may recommend antihistamines.
- Psoriasis. Psoriasis is a skin disease that first appears as small, red papules topped by fine, silver-white scales. The scales are attached at the center of the lesion and leave a fine bleeding point when detached. Because psoriasis is a chronic disease, it is likely that the mother with psoriasis appearing on her nipple or breast is familiar with the condition. Breastfeeding is not contraindicated.
- Poison ivy. See previous discussion of this condition.
- *Candida* infection, thrush, or yeast on the nipple or breast (Color Plate 7–20). Although nipple or breast skin affected with an overgrowth of *Candida albicans* may not look any different from nonaffected skin, the mother reports excruciating pain during feedings, between feedings, or both. The mother's nipple and/or areola may appear bright pink or red and the mother might complain of itching in this area.

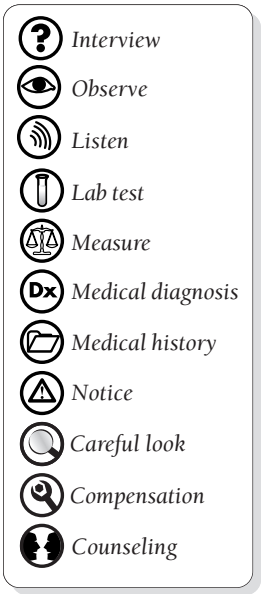
Diagnosis of yeast of the breast or nipple is often one of exclusion or presumed because the infant has white, yeasty patches in its mouth. The infant's diaper area may also have a skin rash. Laboratory testing is difficult because *Candida* may also live harmlessly on the skin.

Research has indicated that breastfeeding women with two or more of the following signs or symptoms are likely to test positive for *Candida*:

- Shiny or flaky skin of the nipple/areola
- Sore but not burning nipples
- Burning pain on the nipple/areola
- Nonstabbing pain in the breast
- Stabbing pain in the breast

If the signs and symptoms include either shiny skin of the nipple/areola with stabbing pain or flaky skin of the nipple/areola in combination with pain, then women were highly likely to test positive for *Candida* (Francis-Morrill et al., 2004).

Consider possible sources of contamination or vectors such as pacifiers, breast pump parts, towels, sexual partners, and so on.



Other skin conditions

- Tattoos, if present, do not interfere with breastfeeding.
- Dimpling of the breast or areola can be seen alone or in combination with a lump, off-center nipple, and/or peau d'orange (dimples similar to those on an orange peel).

  Dimpling or peau d'orange should be examined by a physician immediately. These appearances are associated with breast cancer.
- Moles. Women may have moles on their breasts, as they may have moles on other parts of their body. The moles do not interfere with breastfeeding. Women with moles should consult with their physicians and give themselves a skin self-exam regularly. According to the American Cancer Society, be concerned if moles change suddenly or have the A, B, C, D characteristics:
  - A is for asymmetry; one-half of the mole does not match the other half of the mole.
  - B is for border; irregular, ragged, notched, or blurred edges.
  - C is for color; the pigmentation is not uniform with different shades of brown and black, sometimes with patches of red, white, and blue.
  - D is for diameter; greater than 6 millimeters (American Cancer Society, 2001).

Pigmentation alterations

- Hyperpigmentation, or areas of more intense color on the breast, is unrelated to breastfeeding.
- Stretch marks radiating out from the areola may be noted (Color Plate 7–21) Stretch marks are benign and may be seen as yellow, red, bluish, white, or brown streaks on the breast.
- Erosion of the pigmented layer of skin can be the result of a faulty position for breastfeeding or pressure from some other source. One area of the nipple may have been subjected to repeated trauma such that several layers of skin have been scraped off.

  Observation of the location of the pigment erosion from faulty positioning can provide helpful clues to the positioning problem. Generally, the eroded area has been abraded by inappropriate positions, scraped along the infant's hard palate, or the ridge between the hard and soft palate.

Partial or absent sensation of the areola and nipple

Partial or absent innervation of the nipple or areola may negatively impact the production and delivery of milk. This is especially important to assess if the mother has a history of the following:

- Surgery, especially breast reduction or augmentation using the periareolar technique
- Trauma to the chest, such as in a car accident
- Placement of a chest tube, especially if the mother herself was born prematurely

Ask the mother to describe the sensation she feels as she moves her finger around the areola. Can she feel the movement of her finger? Is the sensation equal around the whole areola? Ask the mother if the nipple responds to cold or sexual stimulation by becoming more everted.

Observe the nipple during a feeding. Does the nipple evert, responding to the infant's lips?

If there is any question about the innervation of the nipple and/or areola, it is important to provide close pediatric follow-up and frequent weight checks of the infant.

Absence of nipple—Athelia

Mammary tissue without nipple tissue may be found in an accessory breast or in an otherwise normal breast. This is usually a congenital malformation but may also be due to the following:

- Nipple trauma
- Nipple burn
- Nipple surgery (removed during breast reduction or augmentation but reattachment was not successful)

An innervated nipple with patent ducts is necessary for continued production of milk. Lack of nipple tissue will not affect lactogenesis II (the abundant supply of milk "coming in") but will compromise the continuing production of milk (lactogenesis III).

Inverted nipples

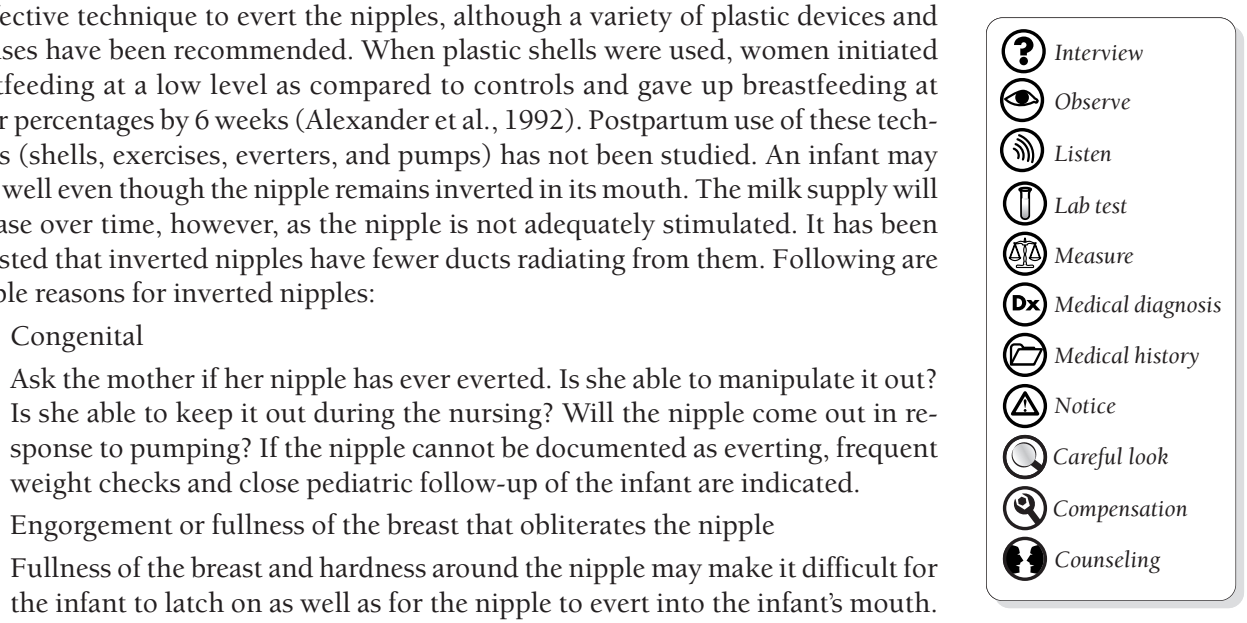
Inverted nipples retract inward (toward the chest wall) when stimulated rather than outward. If the nipples remain inverted during a feeding, the nipple may not be adequately stimulated, resulting in very little prolactin secretion and, thus, little milk production. In research studies of breastfed infants readmitted to the hospital for breastfeeding malnutrition (failure to thrive) and dehydration, three out of five infants had mothers with inverted nipples (Cooper et al., 1995).

The "pinch test" is often recommended to check to see if inward retracting nipples are truly inverted. The nipple and areola are pressed between the thumb and forefinger. The inverted nipple will retract. It is not possible to know how a nipple will function solely by looking at it in its resting state or compressing it. The assessor must observe a feeding before coming to any conclusion about the possible impact of an unusual nipple presentation on feeding.

Inverted nipples have been classified into three grades (Han & Hong, 1999):

- Grade 1 inverted nipples—are easily pulled out (by using a breast pump or by the infant nursing well, for example). See the inverted nipples shown in Color Plate 7–22 prior to feeding, and in Color Plate 7–23 immediately after feeding.
- Grade 2 inverted nipples—can be pulled out but don't maintain their projection (most inverted nipples fall into this group).
- Grade 3 inverted nipples—are difficult or impossible to pull out.

Women with inverted nipples before or during pregnancy may find that their nipples evert by the end of pregnancy. The frequency of inverted nipples is not known. The effect on lactation may depend on the degree of inversion. During pregnancy, there is no effective technique to evert the nipples, although a variety of plastic devices and exercises have been recommended. When plastic shells were used, women initiated breastfeeding at a low level as compared to controls and gave up breastfeeding at higher percentages by 6 weeks (Alexander et al., 1992). Postpartum use of these techniques (shells, exercises, everters, and pumps) has not been studied. An infant may nurse well even though the nipple remains inverted in its mouth. The milk supply will decrease over time, however, as the nipple is not adequately stimulated. It has been suggested that inverted nipples have fewer ducts radiating from them. Following are possible reasons for inverted nipples:



- Congenital

  Ask the mother if her nipple has ever everted. Is she able to manipulate it out? Is she able to keep it out during the nursing? Will the nipple come out in response to pumping? If the nipple cannot be documented as everting, frequent weight checks and close pediatric follow-up of the infant are indicated.
- Engorgement or fullness of the breast that obliterates the nipple

  Fullness of the breast and hardness around the nipple may make it difficult for the infant to latch on as well as for the nipple to evert into the infant's mouth. Fullness may be relieved by hand expressing or gently pumping or soaking the breasts in a basin of lukewarm water. Gentle massage may also be helpful.
- Cancer of the breast (causing a distortion of the breast and nipple)

  Prompt attention from a diagnostician is required if the breast or nipple is distorted (as shown in Color Plate 7–9) or if any other signs of breast cancer are described. The signs of breast cancer listed by the American Cancer Society (2001) include:
  - A new lump or a mass in the breast. A lump that is painless, hard, and has irregular edges is more likely to be cancer. But some cancers are tender, soft, and rounded.
  - Skin irritation or dimpling.
  - Nipple pain or the nipple turning inward.
  - Redness or scaliness of the nipple or breast skin.
  - A nipple discharge other than breast milk.
  - A lump in the underarm area.

Flat nipple

The flat nipple does not protrude away from the areola at rest but everts in response to cold or sexual stimulation. The congenital flat nipple may evert due to changes

during pregnancy or in response to active suckling. Following are possible reasons for the flat nipple:

- Congenital

  Ask the mother what has caused her nipple to evert in the past. Is she able to manipulate it out? The flat nipple will generally evert appropriately in the infant's mouth during nursing.

- Engorgement or fullness of the breast

  It may be difficult for the infant to latch on to the very full breast. Fullness may be relieved by hand expressing or gently pumping, showering, or soaking the breasts in a basin of lukewarm water. Gentle massage may also be helpful.

- Lack of stimulation

  An infant does not need an everted nipple in order to latch on to the breast. Careful attention to positioning and attachment will assist the infant to latch on to a breast with a flat nipple.

- Use of muscle relaxants

  Ask the mother about any labor analgesia, prescription or over-the-counter drugs, herbal remedies, or teas she may have been given or may be taking.

Unusually shaped nipples: Bifurcated, club headed, raspberry, long, short, etc.

Although most nipples fit into a similar configuration, occasionally a breastfeeding mother may have an unusually shaped or sized nipple. There is no reason to assume the infant will not feed on the unusual nipple. Achieving an optimal gape and ensuring that the infant nurses with a wide-open mouth may be helpful.

Following are possible reasons for the unusually shaped nipple:

- Congenital. See the raspberry nipple shown in Color Plate 7–24. This nipple functioned normally; however, others that look like this may not function normally.
- Trauma

  Deep nipple fissures from improper breastfeeding position can permanently bifurcate, or divide, the nipple.

  The nipple pores of unusually shaped nipples may or may not be patent (open). The nipple may not function in lactation. Close follow-up to assure patency is recommended. (See Appendix A.)

Fissures or cracked nipples

Fissures are ulcers or crack-like sores on the breast. They usually correspond to areas that have been pinched consistently during nursing or areas of abrasion due to poor positioning. They may be caused by any of the following:

- Trauma to the nipple from incorrect positioning, as shown in Color Plate 7–25.

  Correcting the positioning of the infant during breastfeeding should help stop nipple trauma thereby fostering healing fissures that have been caused by faulty latch on. If there is also a nipple infection, antibiotic therapy may be necessary.

- Herpes lesions. Breastfeeding is contraindicated while there is a herpes lesion on the breast. See the section "Blisters on the breast or areola" for more information.

White or "blanched nipple"—Raynaud's phenomenon—nipple vasospasm

Raynaud's phenomenon is an episodic ischemia usually noted in the fingers and toes and associated with debilitating pain precipitated by exposure to cold among other stimuli. Lawlor-Smith and Lawlor-Smith (1996) and Anderson et al. (2004) have described Raynaud's of the nipples. General discussions of Raynaud's phenomenon do not usually describe symptoms in the nipples. See the progression of color change on Color Plates 7–26, 7–27, and 7–28. Color Plate 7–29 shows vasospasm during pumping.

Anderson and colleagues (2004) reported that signs and symptoms of Raynaud's phenomenon are often mistaken for infection with *Candida albicans*. Raynaud's phenomenon has also been associated with a history of breast surgery/implants and autoimmune disease.

Not all nipple vasospasm is considered to be associated with Raynaud's phenomenon. Raynaud's is associated with symptoms in other extremities and the mother should report a history of Raynaud's prior to breastfeeding.

In general, the symptoms of Raynaud's phenomenon or nipple vasospasm are

- Debilitating pain associated with the removal of the nipple from the infant's mouth.
- Blanching of the nipple. The nipple is uniformly white immediately when removed from the infant's mouth.
- Biphasic or triphasic color sign. The nipple is observed to change from white to blue to normal color or white to blue to raspberry and back to normal color in minutes after the end of a nursing.

Medication may be indicated. Mothers should also try to avoid changes of temperature (apply warmth to the nipple as soon as the nursing ends) and avoid smoking and caffeine.

Blanching and biphasic or triphasic color changes with debilitating pain may also be associated with untreated nipple trauma with infection.

Appropriate treatment involves pharmaceutical therapy, correcting improper positioning that contributes to continued nipple trauma, and palliative care—warmth following nursing, for example.

White blanched lines on the nipple

Lines on the nipple that are associated with the shaping of the nipple by the infant's mouth during nursing indicate poor positioning. The nipple should have the same shape and color after a feeding as before. White lines, such as those shown in Color Plate 7–30, indicating disruption of blood supply to those areas of the nipple during the nursing, are usually precursors to cracks or fissures. Blanching on the end of the nipple usually indicates that the nipple has been wedged along the roof of the infant's mouth during the nursing. Blanched lines along the length of the nipple may indicate that the nipple is being compressed between the gums during the feeding.

Observe the nursing and correct positioning.

Interview
Observe
Listen
Lab test
Measure
Medical diagnosis
Medical history
Notice
Careful look
Compensation
Counseling

Loose skin on the breast or nipple

Loose or hanging skin on the breast or nipple may be due to the following:

- Skin tags

  Skin tags on the nipple may be painful during nursing or not a concern. The physician may remove a tag without interrupting the function of the lactating nipple.

- Trauma from an improper nursing position

  If the area also shows signs of infection, refer the mother to a physician for evaluation and possibly antibiotic treatments. Evaluate and correct improper nursing position in order to facilitate healing.

Piercing

Body piercing on the breast or nipple has the potential to interfere with breastfeeding. There are several factors that may impact breastfeeding:

- The size and location of the piercing may interfere with milk flow. If the piercing has cut through ducts in the nipple, milk flow may be blocked and plugged ducts may result. Milk may leak through the piercing.
- The amount of infection the mother may have previously experienced and the severity of any scarring from past infections may cause duct and nipple pore patency to be compromised.
- The nipple ring may be located on a part of the breast that goes into the infant's mouth or on the nipple. If this is the case, one concern may be whether the ring is secure or is in any danger of coming loose in the infant's mouth. Another concern may be that the ring would take up too much room in the infant's mouth or otherwise interfere with the suckling. The mother should be advised to remove the ring for breastfeeding.

Erosion of skin through suckling—abrasion

Continued improper positioning in the same way may abrade the nipple and erode layers of skin. This damaged area may have lost its pigment and be vulnerable to infection.

Observe carefully for infection in cases of abrasion. Topical or systemic antibiotic therapy may be indicated.

Help the mother position the baby at the breast to prevent abrasion and further nipple damage.

Assessment of breast secretions

Colostrum, transitional milk, and mature milk

From mid-pregnancy until 2 to 3 days postpartum, the hormones of pregnancy influence the production of colostrum. This is called lactogenesis stage I. Copious milk production normally is seen on the second or third day postpartum in response

to the precipitous drop in progesterone that comes from the complete delivery of the placenta (Cregan & Hartmann, 1999).

- Colostrum is thick and creamy and ranges from yellow to yellow-orange in color.
- Transitional milk (day 2–3 through 7–10) is a mixture of colostrum and mature milk.
- Mature milk (usually after day 7–10) is watery, bluish in color, and contains no colostrum. The fat in human milk will float to the top of a container of milk and form a thick, creamy layer.

Nonmilk discharges from the nipple should be evaluated. They may be of significance and should be evaluated and diagnosed.

- Unusually colored milk has also been reported. In some cases, the infant's urine is also unusually pigmented. Most of the reports of colored milk attribute the color to pigments in substances the mother has been exposed to in her diet, by medications, vitamins, and other supplements.

  Pink or pink-orange milk has been reported after exposure to red and yellow food dyes. Colored urine in the infant has also been reported (Roseman, 1981).

  Pink, red-brown, or bloody milk (guaiac positive), also called "rusty pipe" milk, is generally attributed to minor rupture of blood vessels in the breast (see Color Plate 7–31). It may be related to pumping with too high vacuum pressure.

  Blood in milk is always of concern. The mother may not know her milk is bloody until the infant's stool is positive for blood (guaiac test for occult blood). Although this is not harmful to the infant, medical evaluation is imperative to rule out pathology.

  Greenish milk and green-tinged urine in the infant have been associated with the mother drinking green beverages, eating seaweed, or taking tablets of kelp or natural vitamins (Lawrence & Lawrence, 1999).

  Black milk has been associated with the mother taking the drug minocycline (Hunt et al., 1996).

- Purulent discharge—Pus may be discharged from the nipple. It is usually yellow or yellow-green in color and is associated with mastitis or abscess. If pus is red, it indicates that small vessels have ruptured.

  Diagnosis and antibiotic therapy are indicated.

Interview
Observe
Listen
Lab test
Measure
Medical diagnosis
Medical history
Notice
Careful look
Compensation
Counseling

Counseling Implications

Important counseling issues related to assessment of the mother's pain include:

- Gaining an understanding of the mother's level of pain.
- Exploring options with the mother to resolve and/or compensate for the pain.
- Providing ongoing assessment, follow-up, and support until the pain has been resolved.

Difficulty achieving optimal positioning of the infant at the breast

The mother may be assessed to have difficulty with achieving optimal positioning because of

- Lack of skill, challenges to dexterity on the part of the mother, especially with multiples, with large breasts, or other challenges.
- Neural and/or muscular impairment of the mother, such as a mother with cerebral palsy, post-stroke, or carpal tunnel syndrome.
- Congenital anomaly, such as the mother who has one arm.
- Trauma, such as a mother who has had spinal injury resulting from a car accident.
- Medications, such as pain medication that may cause drowsiness.

The goal in working with mothers who are challenged is to ensure the safety of the infant and the comfort of the mother while also optimizing breastfeeding.

Counseling implications

Important counseling issues related to assessment of the mother's ability to achieve optimal positioning of the infant include

- Gaining an understanding of the mother's expectations of her ability to position the infant at the breast.
- Offering the mother the opportunity to explore her feelings regarding her expectations of and her existing capacity to position her infant.
- Exploring options with the mother to compensate for any suboptimal capabilities to position her infant at the breast.
- Mothers of preterm infants may appreciate having an assessor by their side, especially for the first several breastfeeding sessions, to gain self-confidence in their ability to manage breastfeeding on their own.

Vaginal discharge (Lochia)

The mother's report of her vaginal discharge should be consistent with the amount of time elapsed in the postpartum period. The red vaginal discharge that begins after the infant is born normally changes to a brownish discharge and then yellow in a few days. Continuation of a red discharge past the early days is a sign that there may be retained placental fragments.

In addition to signaling that the normal hormonal progression toward lactogenesis II and the production of copious amounts of milk is compromised, continuing red discharge may indicate impending hemorrhage. Further assessment of the mother's condition is imperative.

The rapid drop of progesterone comes from the complete delivery of the placenta initiating lactogenesis II 30 hours to 40 hours later (Cregan & Hartmann, 1999). The rapid drop in progesterone can be inhibited by

- Retained placental fragments. Prolonged blood-tinged discharge and a delay in the onset of lactogenesis II may be indicative of retained placental fragments.

- Endocrine condition.
- Progesterone-containing drugs.

Fatigue

Continuing fatigue in the nursing mother should be investigated. The mother may have anemia. Her inadequate levels of blood iron may be due to

- Chronic anemia.
- Anemia due to excessive peripartum blood loss.

Mothers with inadequate levels of blood iron may complain of fatigue, have difficulty with problem solving and be at higher risk for mastitis and recurrent mastitis (Fetherston, 1998). Diagnosis and appropriate therapy are imperative.

Other possible contributors to fatigue include the following:

- Low thyroid levels
- Other endocrine condition (permanent or temporary)
- Postpartum mood disorder
- Sleep disturbances
- Prescription drugs, alcohol, substance abuse
- Adjustment to the parenting role

Counseling implications

Important counseling issues related to assessment of the mother's level of fatigue include

- Gaining an understanding of the mother's level of fatigue and the degree to which it impacts her activities of daily living and breastfeeding her infant.
- Exploring the options to the mother to aid in resolving and/or coping with fatigue.
- Assuring the safety and adequate nourishment of the infant.
- Providing ongoing support and encouragement, relative to the degree of the mother's fatigue level, in an effort to ensure breastfeeding success for this mother-infant dyad.

Mother does not nurse or remove milk appropriately

Occasionally, a mother professes a desire to breastfeed but seems unwilling to feed the infant—express or pump. The mother may not recognize feeding cues or may misinterpret them, resulting in the chronic underfeeding of the infant. This may be due to the following:

- Chronic/situational depression
- Substance abuse
- Cognitive dissonance
- Educational barrier such as low reading ability
- Language barrier or inability to read the language
- Mother/infant separation
- Inadequate opportunity for teaching or learning

- Misunderstanding of concepts of lactation
- Inadequate teaching
- Inability to understand
- Impaired ability to understand teaching due to language level or language barriers
  - General
  - Situational (stress, pain, etc.)

Merely encouraging the mother to feed appropriately or reeducating her about appropriate feeding may be inadequate if the mother is depressed, intoxicated, cognitively impaired, and so on. The safety and adequate feeding of the infant must be the first concern.

Counseling implications

Important counseling issues related to assessment of the mother who is not nursing or removing milk appropriately include

- Gaining an understanding of the mother's expectations regarding the infant's feeding pattern or the pattern of milk removal. Offer education to compensate for any areas of knowledge deficits.
- Offering the mother the opportunity to explore her feelings regarding breastfeeding or pumping.
- Exploring options to compensate for any conditions of suboptimal breastfeeding or milk removal.
- Assuring the infant is adequately nourished.
- Providing ongoing support and encouragement, relative to the degree of suboptimal breastfeeding or milk removal, in an effort to ensure breastfeeding success for this mother-infant dyad.

Pain

Breastfeeding should be a pleasurable activity. Mothers should be encouraged to seek help for any pain or discomfort. The mother's sensation during nursing may be assessed on a five-point scale:

5 = Very severe pain
4 = Severe pain
3 = Moderate pain
2 = minor discomfort
1 = No pain, just tugging

(Healthy Children Project, 2000)

The mother should also be questioned about when the pain occurs, such as,

- During the entire feeding. This may be indicative of improper latch and/or suckling or a breast or nipple condition.

- At the beginning of the feeding only. This may be indicative of poor positioning that the infant corrects when accommodating the flow of milk after the milk lets down.
- Between feedings. This may be indicative of *Candida*, trauma, infection, and Raynaud's phenomenon, for example.
- Constantly. This may be indicative of trauma, infection, and inadequate drainage.

Counseling implications

Important counseling issues related to assessment of the mother's pain include:

- Gaining an understanding of the mother's level of pain.
- Exploring options with the mother to resolve and/or compensate for the pain.
- Providing ongoing assessment, follow-up, and support until the pain has been resolved.

Nonbreast discomfort related to feeding

On occasion, mothers describe other physical, systemic symptoms associated with breastfeeding, including

- Nausea. Nausea associated with feeding is thought to be associated with oxytocin release and nipple vasospasm or Raynaud's phenomenon.
- Headache. Headache associated with feeding is thought to be associated with oxytocin release and nipple vasospasm or Raynaud's phenomenon (Lawlor-Smith, 1997; Thorley, 1997).
- Migraine. Migraine related to feeding is associated with Raynaud's phenomenon.

Recurrent and/or severe headaches should be further assessed for appropriate diagnosis.

Women occasionally report psychic discomfort related to feeding. Reported symptoms include

- Uncomfortable feelings related to the infant at the breast. This may be due to the mother's
  - Emotional reaction to breastfeeding.
  - Lack of confidence in her ability to breastfeed.
- Panic/anxiety related to feedings. This may be related to:
  - Postpartum reaction disorder.
  - Preexisting condition in the breastfeeding mother.
  - Drugs.
  - Physical condition, e.g., thyroid storm.

Observation of panic or anxiety in the mother or the mother's report of panic and/or anxiety and/or any symptoms of concern requires prompt evaluation from the appropriate practitioner.

Counseling implications

Important counseling issues related to assessment of the mother's nonbreast discomfort related to feeding include

- Providing a safe, nonjudgmental environment in which the mother can verbalize her feelings.
- Exploring options with the mother to aid her in resolving and/or coping with nonbreast discomfort.
- Assuring the safety of the mother and the infant.
- Providing ongoing support and encouragement, relative to the degree of nonbreast discomfort, in an effort to ensure breastfeeding success for this mother-infant dyad.

Section IV

Artifacts and Documentation

8 Consideration of Artifacts in the Breastfeeding Assessment

Introduction

Artifacts are items that require assessment in addition to the mother, the infant, and the feeding interaction. An artifact is anything that can be examined to learn more about the breastfeeding situation.

An artifact is neither good nor bad itself; it must be understood in the context of the situation. For example, a breast pump may discourage one mother from breastfeeding because it makes her feel like a cow being milked, while the same pump may be seen as a lifeline for another mother. In assessing an artifact, the examiner should ask

- What artifacts are relevant to this breastfeeding situation?
- What artifacts do I see in the environment?
- What artifacts do I have access to?
- What artifacts should I question the mother about?

The artifact must also be evaluated in context for relevance. For example, the presence of a pacifier in an infant's mouth may be pivotal when slow weight gain or nipple pain are present, but not of immediate relevance to breastfeeding in counseling a mother with a thriving older baby who is seeking advice on how to express milk at work.

Of particular concern is the rise of technology designed to improve breastfeeding. Technology has its place; however, technology should not take the place of skillful assessment and intervention.

Milk as an artifact

Milk itself falls into the category of an artifact because it can be examined for physical characteristics that tell us about the process of lactation and may give us clues about problems that need to be solved. For example, if the stages of lactogenesis do not progress within the time frames given below, then a thorough assessment for proper breastfeeding technique as well as potential physical problems with the mother and/or the baby needs to occur.

The stages of milk production have visible characteristics that are stage dependent. (See Color Plate 6–3.)

- During Lactogenesis I, the milk is colostrum. Colostrum is a thick yellowish fluid the production of which is determined by the hormones of pregnancy. Some women leak colostrum during the later stages of pregnancy.
  - The color (due to concentrations of ß-carotene) ranges from yellow to orange-yellow.
  - Colostrum is secreted in small volumes, varying from 2 to 20cc per feeding in the first several days of life (Lawrence & Lawrence, 2005).
  - Because colostrum is so thick and in such small volumes, it is an ideal secretion for the newborn to learn to coordinate suck-swallow-breathe.
  - Colostrum is also very high in protein, especially the immunoglobulins, and also contains the highest levels of immunologically competent mononuclear white blood cells. Colostrum is frequently referred to as the infant's first vaccination.
  - Colostrum also has a laxative effect on the infant and is useful in moving meconium stools in the first several days of life, helping to prevent the pool of unconjugated bilirubin in the meconium from recirculating and elevating levels of jaundice.
  - The colostral phase occurs during pregnancy and the first 2 to 3 days postpartum.
- Lactogenesis II is the onset of milk production and is triggered by the rapid drop in progesterone that results from the complete separation and delivery of the placenta (Cregan Hartmann, 1999). At this point mature milk is produced and mixes with the colostrum and is called *transitional milk*.
  - Transitional milk appears to look more like what mothers expect milk to look like (i.e., cow milk) but still contains the yellowish pigment of colostrum.
  - During the transitional phase there is a marked increase in volume due to increasing concentrations of lactose that act as an osmotic force and draw fluid into the milk.
  - Fat concentration and total caloric content also increase during the transitional phase, while protein concentration decreases.
  - Transitional milk occurs between days 2 to 3 and days 7 to 10.
- Lactogenesis III is ongoing milk production and is characterized by the presence of mature milk and the absence of colostrum.
  - Changes in milk composition have slowed. Mature milk may look more bluish than yellow.
  - Lactogenesis III occurs more successfully if prolactin receptors have been primed by frequent nursing in the postpartum colostral phase.

Expressed Human Milk

When a mother is breastfeeding, the milk is transferred directly into the esophagus and stomach of the baby without ever being visible. Therefore, mothers may be sur-

prised when they express milk to see that milk does not necessarily look like what they expected.

- Expressed mature milk, if allowed to sit for a while, will separate into two visible layers. The bottom layer is watery and bluish in color. The top layer will be much thicker in consistency and look creamier. This is the fat layer, which floats to the top.
- Unusually colored milk has been reported. In some cases, the infant's urine may also be unusually pigmented. Most of the reports of colored milk attribute the color to pigments in substances that the mother has ingested, such as foods, drinks, medications, and herbal home remedies.
  - Pink or pink-orange milk has been reported after exposure to red and yellow food dyes. Colored urine in the infant has also been reported (Roseman, 1981). Fresh beets may also change the milk of the mother to a red-pink color (Lawrence & Lawrence, 2005, p. 350)
  - Very orange milk has been observed in women who drink vegetable juices containing a lot of carrots and ß-carotene.
  - Greenish milk and green-tinged urine in infants has been associated with the mother drinking green beverages, eating seaweed, or taking tablets of kelp or natural vitamins (Lawrence & Lawrence, 2005, p. 350).
  - Black milk has been associated with the mother taking the drug minocycline as therapy for acne (Hunt et al., 1996; Lawrence & Lawrence, 2005, p. 350).
- Some milk may be colored because of blood or pus in the milk. Pink, red-brown, or bloody milk (guaiac positive), also called rusty-pipe milk, is generally attributed to ruptured blood vessels in the breast (see Color Plate 7–31). It may be related to pumping milk with too-high vacuum pressure. It may also be due to cracked and bleeding nipples.
  - Blood in milk is always of concern. The mother may not know her milk is bloody until the infant's stool becomes positive for blood (guaiac test for occult blood). Although ingesting blood is not harmful for the infant, medical evaluation is imperative to rule out pathology.
  - Pus may also be discharged into the milk from the nipple. It is usually yellow or yellow-green in color and is associated with mastitis or abscess. If pus is red, it indicates that small blood vessels have ruptured.
  - Diagnosis and therapy are indicated.
- Mothers may also notice different smells in milk. Babies notice flavor changes in milk and seem to prefer flavored milk. Menella and Beauchamp (1991) reported that in a controlled trial, babies who were exposed to garlic flavor in their mother's milk actually consumed more than when the milk had no garlic flavor in it.
  - Some mothers report a "soapy" or "rancid" smell in their expressed milk when it has been stored for several days in the refrigerator or frozen and then thawed. This is the result of lipases (fat-digesting enzymes) in the milk continuing to break down some of the milk fat during storage. Some milk fats give off this peculiar small when they are broken down. Many babies are not concerned about the change in flavor, but other babies may refuse the milk. A change in smell from this cause is not harmful to the

infant. Scalding the milk prior to freezing may reduce the "soapy" smell in future stored milk.

- Older children who have been on banked donor milk have been able to identify flavors and sometimes individual donors because of the flavors in the milk.
- Anthropologists believe that this is a way in which children become acculturated to the flavors of ethnic foods. Toddlers may move to table foods more easily when they have been breastfed and exposed to different flavors in the milk (Mennella et al., 2001).

Artifacts of storage and handling of expressed milk

Manual expression

Many mothers prefer to use their own hands to express milk rather than a mechanical device. Hand expression has a number of advantages:

- The mother's hands are always available and need only to be washed prior to manual expression.
- No power source is required.
- Manual expression is not noisy. In an office setting others may have no idea that the mother is expressing while carrying on a conference call!
- Expertise with manual expression comes with frequent practice. Many women find that manual expression is easier, faster, and extracts more milk than a mechanical pump.
- Becoming comfortable with touching one's breasts and learning how they feel during different stages of life may be life saving. Changes in appearance and feel may be indicative of breast cancer, and the woman who is comfortable with feeling her breasts and knows what "normal" feels like may notice these changes sooner.

See Appendix B for instructions on how to express milk manually.

Pumps

Pumps (Color Plate 8–1) should be chosen and used in a way that is appropriate for the situation. A pump is not necessary for many breastfeeding mothers. Assess the reasons behind the mother's request for a pump. Perhaps she is concerned about milk supply and needs help maximizing her at-breast feedings.

The wide range of pumps available complicates the selection of the appropriate pump. Pumps may be classified according to the amount of use expected:

- Occasional-use pumps are inexpensive and largely ineffective at building a milk supply, but might be used to express a small amount of milk.
- Casual-use pumps are used by a mother when she is away from a nursing infant—at work or school, for example.

Pumps suitable for a pump-dependent mother are capable of keeping up a milk supply for some time when used appropriately.

Pumps may also be classified by:

- Personal use. These pumps are not to be shared between mothers, even with the replacement of some parts.
- Multiple use. The manufacturer has provided assurance that the parts of these pumps that could become contaminated are provided individually to each mother.

Pumps can also be considered according to the *source of energy*. The energy source can be:

- Manual. The mother serves as the source of power. These are usually casual-use pumps, for personal use only.
- Battery operated. The power of these pumps is not as strong as the electric breast pumps and, therefore, they are usually only indicated for occasional or casual use. These are personal use pumps.
- Electric personal use. These casual-use pumps often have an optional car adapter.
- Rental grade electric. These pumps are indicated for the mother who is separated from her infant (if the mother or infant remains hospitalized or for example, if there are multiples, or if the mother is returning to work or school). Rental grade electric breast pumps may also be used when there are concerns about milk supply.

The use of pumps should always be preceded by a thorough assessment of the breastfeeding situation. There are circumstances wherein mechanical milk expression via hand or pump is the only feasible way to initiate and build a milk supply (e.g., infants who are unable to feed at the breast due to severe defects, illness, or prematurity). Otherwise, pumping should not interrupt or supercede feeding at the breast. Pumping while nursing may maximize the amount of milk collected (Figure 8–1). When a pump is deemed to be an appropriate intervention, the pumping mother should always receive proper instruction and counseling regarding the use and care of the pump and pump parts.

The yield of milk generated by a pumping mother should not be used to measure the mother's milk supply. Most pumps operate solely on suction, or negative pressure, and are thus not performing all of the dimensions of the breastfeeding system. Mothers may be able to pump only a fraction of the milk that an infant would elicit from the breast.

Milk storage containers

The best storage container for milk is the breast. However, many women face separation from their infants on a daily basis and provide their milk through expression. There are a variety of storage containers available for mothers to use to store their expressed milk. These can be categorized by the type of material used in their manufacture as well as by their physical properties. Each type of container has drawbacks to long-term storage of milk.

Soft-sided containers. These containers are the polyethylene storage bags designed for storing milk long term as well as feeding infants. All bags are not created equally!

FIGURE 8–1
Pumping while breastfeeding.
Used with permission. © Health Education Associates

There are some that are relatively thin and easily damaged. Others are thicker (several ply) but may have similar problems in terms of damage and splitting.

Advantages include

- Convenience of the bags that are disposable and fit certain feeding systems. Some pump models also allow mothers to express directly into the bags.

Disadvantages include

- High potential for damage to the bag. If overfilled, bags may split when frozen. Bags may be easily damaged by other packages in the freezer. Thawing then causes loss of the milk when it runs out the hole or split in the bag.
- Elevated risk of contamination. Bags may be more easily contaminated when milk is extracted from them because they are not self-supporting.
- Lack of an airtight seal when twist-ties are used.
- Loss of milk components to the polyethylene material of the bag. Milk fats adhere to polyethylene selectively. Fat-soluble vitamins may also be lost as a result (Hamosh, 1994).
- Possible loss of up to 60 percent of secretory IgA specific for polysaccharides in the coat of the *E. coli* bacterium (Goldblum et al., 1981). This may be a potential problem in settings where coliform infections are an issue, such as child care settings and NICUs.
- Expensive cost per bag. Bags are not recyclable.
- Potential for light degradation of milk components.

Hard-sided plastic containers. These containers may be made out of polypropylene, polystyrene, or polycarbonate. The research literature covers only polypropylene containers. Hard plastic containers need not be bottles but can be other types of small-volume food storage containers with airtight lids.

Advantages include

- Not easily damaged unless dropped and cracked.
- Frequently come with screw-cap lids that form an airtight seal.
- Recyclable and reusable.
- Universal threads that attach to pump kits on some types of containers. Milk can be pumped directly into these containers.

Disadvantages include

- Loss of white blood cells to sides of container (a moot point when discussing frozen milk because white cells have loss of function when frozen).
- Potential for light degradation of milk components.
- Manufacture by the formula industry.
- Expense, depending on manufacturer.

Glass containers. Most glass containers that fit onto pump kits are manufactured by the formula industry and are difficult to acquire unless in the hospital setting. Even then, materials for many containers have been switched to plastics.

Advantages include

- Frequently have screw-cap lids that are airtight.
- Recyclable and reusable.
- Less loss of white blood cells in fresh milk than plastics.

Disadvantages include

- Breakage, including chipping that has the potential for getting into the milk. Some child care providers refuse to accept feedings in glass containers.
- Potential for light degradation of milk components.
- Not always easy to find.

Milk storage durations and temperatures

Recommendations for duration of storage differ depending on the setting [the hospital (for a sick infant or child) vs home or child care settings (the healthy term infant or older child)] and the temperature at which milk is stored.

Public health recommendations are always conservative, to include as many outliers as possible. Public health recommendations do not always coincide with recommendations that appear in educational materials distributed by proprietary companies. Assessment of such materials for accuracy should be done before they are handed out to parents.

Milk is a food. Although human milk also contains many components that help prevent bacteria from growing in it, the sheer number of bacteria present in the milk may overwhelm these protective mechanisms. When bacteria are allowed to multiply unchecked in milk, they may deplete the nutritional value of the milk to the infant and possibly make the infant ill.

Table 8–1 refers to the optimal storage times at different temperatures for the premature/sick infant/child and the healthy term infant/older healthy child (Arnold, 1999; 2000; 2005; Lawrence, 2005).

Table 8–1. Duration of Storage vs Temperature

	Hospital setting Preemie or sick infant/child	Home/child care settings Healthy term/older infant
Room temperature (25°C = 77°F)	1 hour maximum*	4 hours**
Insulated cooler (15°C = 59°F)	N/A	Up to 24 hours#
Refrigerator (4°C = 39°F)†	48 hours	3–5 days
Freezer (-20°C = -4°F)†	Up to 3 months‡	3–6 months¶

* Milk expressed for the premature or sick infant should be refrigerated immediately and not allowed to sit out at room temperature unless being fed via a continuous delivery system.

** Although Hamosh et al. (1996) state that no significant bacterial growth was evident in the first 8 hours at room temperature, the conservative public health recommendation from these authors is "no more than 4 hours" at the study temperature.

Hamosh et al. (1996) found that working women could safely maintain milk for up to 24 hours in an insulated cooler with a freezer pack such as "blue ice" and that there was minimal bacterial growth.

† Research does not mention a temperature range, but experience dictates it is probably safe for a temperature to fluctuate within ±5°F.

‡ Fat-digestive enzymes continue to react with fats in human milk at these temperatures. Some neonatologists believe that milk frozen beyond 3 months is inadequate for preterm infants. However, using slightly outdated milk is preferable to using formula.

¶ Duration of storage here depends on the type of freezer (whether it is a manual defrost or a self-defrosting model) and how frequently it is opened. Storage durations should be shorter if the freezer warms up continually.

Breast and nipple comfort devices

Breast and nipple comfort devices are products made available with the message of preventing or curing breast problems. Assessment of artifacts should always include questioning the mother about what has been given to her or suggested as aids to breastfeeding. Remember, breastfeeding artifacts must always be considered in context. A breast care cream, when used without correcting the position, may cause the mother to feel as though nothing else can be done for her painful nipples, and then she may abandon breastfeeding. An assortment of these comfort devices is seen in Color Plate 8–2.

Breast shells

Breast shells are hard domes with a flat or curved back and a place for the nipple to protrude into the dome.

If breast shells are being worn by a postpartum mother, check for red rings on the areola or breast indicating too much pressure on the breast. This type of pressure is highly related to mastitis (Fetherston, 1998).

Shells have been used

- By women with sore nipples. These shells have a different back than the shells for inverted nipples. Research indicates they may not be an effective intervention for sore nipples.

- By women with inverted nipples. Historically, breast shells were worn prenatally by women with inverted nipples. This use is no longer suggested (Alexander et al., 1992). Studies of postpartum use of shells for inverted nipples have not been reported.

Breastfeeding pillows

Pillows may help or hinder breastfeeding. Positioning with pillows may interfere with correct latch-on. Ideally, mothers should position their babies comfortably. Pillows may then be used, if needed, to maintain the position comfortably. Mothers may be observed nursing in poor position because their pillow is too high or too low and it changes the angle of the breast/nipple in the baby's mouth. Sore nipples and impeded milk flow may result. Pillows are not a necessity for all mothers.

Creams or soothing agents

Research has shown that optimal positioning of the baby at the breast is key to decreasing breastfeeding pain (Cadwell et al., 2004). Any cream or other agent applied to the area of the breast that the infant contacts when feeding must be safe for the infant to ingest. Even small amounts of cream that are wiped off before feeding may be ingested by the infant. When discussing creams with the mother, be specific about the following:

- Reasons for using the cream
- The type of cream
- How often the cream is being used
- The amount of cream being used
- How the cream is being used

Research studies have shown that creams are placebos at best. Many products are on the market and suggested for nursing mothers. The cream may be

- Lanolin-based cream that is specifically for use on lactating women. These products have been modified and are considered hypoallergenic. Unmodified lanolin that is hydrous may be highly allergenic.
- Vitamin E. Vitamin E is not recommended for use on breasts due to concerns about ingestion by the infant (Marx et al., 1985).
- Petroleum jelly or products with petrolatum. This is not recommended for use on breasts due to concerns about ingestion by the infant.
- Diaper rash ointments. These are designed for external use only. They are not recommended for use on the breast because the infant might consume it.
- Cream that contains bismuth subnitrate, which is thought to be possibly reduced to nitrate by bacteria in the infant's bowel and is a potential cause of methoglobinemia.
- Cream that contains peanut oil and other potentially problematic ingredients. Peanut oil can be aspirated and cause bronchitis or can be an allergen.

Hydrogel and glycerine gel pads may also be found. These products are sold to soothe sore nipples. Both have been shown to be safe and effective for moist wound healing elsewhere on the body. Only products designed specifically for use by breastfeeding mothers should be placed on the breast.

- Other creams and agents. These products, such as skin care creams, moist towelettes, and antiseptic spray, have been used for sore nipples. These items are deemed for external use only and are not recommended for use on the breast of a nursing mother.

Nipple shields

Nipple shields are made of thin silicon or latex. They are worn over the mother's nipple and remain in the infant's mouth when nursing. These shields resemble a sombrero. They have been suggested for use when breastfeeding

- Full-term infants. No clinical evidence supports their routine use for full-term infants. Nipple shields can interfere with milk production and the infant can become accustomed to nursing with a nipple shield.
- Premature infants, assisting the infant to transition to the breast (Meier et al., 2000).

In the report of successful use of nipple shields with preterm infants, the mothers were pump dependent for their ongoing milk supply.

Infant feeding devices

Infant feeding devices have been recovered from archaeological sites of many civilizations. The ones currently used may be characterized as either "at-breast" feeders from which the baby receives nourishment from the device while also breastfeeding or as feeders such as bottles, cups, spoons, etc., with which the baby is fed away from the breast. Commonly available devices are pictured in Color Plate 8–3.

"At-breast" feeding systems

"At-breast" feeders consist of a container to hold the breast milk or formula, joined to tubing lying along the nipple. While the infant suckles at the breast, the tubing delivers additional fluid, as seen in Figure 8–2. Systems include the following:

- Lact-Aid®: A closed system, consisting of a thin tube attached to a cap and plastic disposable bag. The Lact-Aid hangs around the mother's neck with the tube extending to the nipple. Originally designed for adopted infants, this device is also used by women who wish to supplement while nursing. Formulas made from powder and meat are not to be used with the Lact-Aid.
- Supplemental Nutritional System®: A feeding tube system in which two tubes are attached to a plastic container that holds breastmilk or formula. The mother wears the system hanging from her neck with one tube extending to each nipple. As the infant feeds from one side, the tubing of the opposite breast can be closed off to prevent leaking. Formulas made from powder and meat do not flow well through the tubing. A short-term use system with one tube is also available.
- Supply line: An Australian at-breast supplementer similar to the two described above.

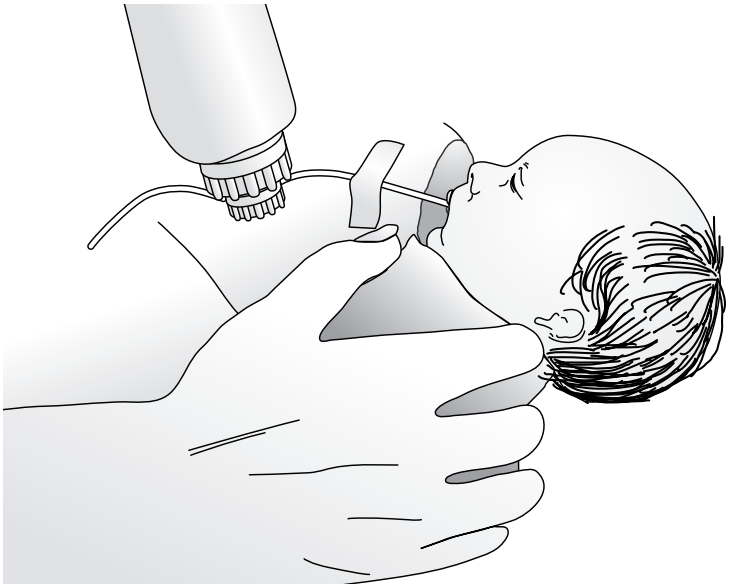


FIGURE 8–2
At-breast supplementation.
Used with permission. © Health Education Associates

Interview
Observe
Listen
Lab tests
Measure
Medical diagnosis
Medical history
Notice
Careful look
Compensation
Counseling

Bottles and artificial nipples

Concerns with bottles and artificial nipples interfering with successful breastfeeding have led UNICEF and WHO to include strong statements against their use. Concerns include the following:

- The breastfed infant may prefer the bottle.
- Infants may develop a preference for a particular bottle nipple.
- Bottles and nipples are hard to clean properly.
- Mothers who are exposed to bottles in the postpartum report that their nipples are more painful.
- Bottles are a popular symbol for infants, leading people to believe that bottles are the normal infant feeding method.

Cups

Using open cups is a safe, alternative feeding method when feeding at the breast is not possible (Howard et al., 1999b). However,

- The cup must be food- or medical-grade.
- Infants may become habituated to the cup.
- The parents need to understand that the method of feeding an infant via a cup is different from their own use of a cup. Infants can aspirate fluid if cup feeding is not performed skillfully. Color Plate 8–4 shows a parent cupfeeding his preterm infant.

Although research as to efficacy is limited, cup feeding appears to be safe for preterm infants (Howard, 1999; Malhotra, 1999; Marinelli et al. 2001) and may facilitate longer breastfeeding postdischarge. However, in some infants a somewhat longer hospital stay may be required.

Finger-feeding device

This artifact is used with the intention of adding nutrition to infants who are having difficulty maintaining a correct suck or latch or with infants who refuse the breast. The mother places a tube on her finger (the finger that is closest in size to her nipple) and the finger is drawn into the infant's mouth. Breastmilk or formula is placed in the container attached to the tube. (Reconstituted powdered formula and meat-based formula should be avoided because they do not flow easily through the tubing.) There are some concerns about this method of supplementation:

- Infants can become addicted to this type of feeding and weaning them to the breast can be difficult.
- Some healthcare professionals consider the placement of a finger inside the infant's mouth to be an invasive procedure and are reluctant to implement this method.
- Some infants have had oral aversion after being fed this way.

There have been no published results of randomized controlled trials of safety or efficacy of this method.

Gavage tube

Gavage tubes are feeding devices used for infants (usually in the neonatal intensive care unit) who are unable to feed orally. The tube is passed through the nose or mouth into the stomach or the small intestine. Breast milk, formula, or other prescribed fluids are administered via the tube.

Periodontal syringe

Periodontal syringes have been used to deliver supplementation to breastfed infants. Concerns about this method include the following:

- The syringe was not designed as a food-grade item.
- The sharp opening of the syringe could cause damage to the infant's oral cavity.

Syringe

In some instances, a medical syringe without the needle has been used to deliver a feeding supplementation to an infant. Presence of this device generally means that a healthcare provider has given it to a mother to supplement an infant with a questionable weight gain. These syringes may be used as an at-breast supplementer or as a finger-feeding device. Syringes are difficult to clean and may pose risks if reused.

Pacifiers

Pacifier use is associated with an increased risk of ear infections and recurrent ear infections in research studies (Niemela, 1995). Pacifiers may be used with

- Preterm infants. Pacifiers may be indicated for use in the special care nursery. Sucking on a pacifier in preterm infants may improve growth, decrease hospital length of stay, and increase the rate of transition to the breast from gavage.
- Full-term infants. There are concerns about use of pacifiers in full-term infants. Pacifier use may decrease breastfeeding duration, as feedings may be

missed and mothers may use them in place of getting help with sore nipples (Howard, 1999a; Righard et al., 1997).

If the assessor notes a pacifier in the environment, further questions should include the following:

- Is the mother scheduling feedings and using a pacifier to stall the infant?
- Does the mother have sore or painful nipples? Is she using the pacifier to decrease the time of feedings?
- Is the infant difficult to soothe without a pacifier?

Written documents

Written documents are artifacts that may be generated by the assessor, healthcare provider, mother, or community. These may include the following documents:

- Care plans for breastfeeding
- Telephone counseling documentation
- Referral forms from other providers
- Laboratory reports
- Medical records
- Assessment documents
- Infant growth records
- Educational pamphlets on breastfeeding management
- Community resource list

These written documents should be reviewed by the assessor and taken into consideration with respect to the context of the mother's and infant's breastfeeding experience.

Breastfeeding assessment tools

A variety of assessment tools have been developed. Validity, interrater, and intrarater reliability have not been demonstrated for many of these tools (Riordan & Koehn, 1997). Tools in use include the following:

- LATCH (Jensen et al., 1994)
- IBFAT (Infant Breast Feeding Assessment Tool) (Matthews, 1988)
- MBA (Mother Infant Assessment for Breastfeeding) (Mulford, 1992)
- SAIB (Systematic Assessment of the Infant at Breast) (Shrago & Bocar, 1990)
- LAT (Lactation Assessment and corrective intervention Tool) (Healthy Children Project, Inc., 2000)

Other resources for assessors

Healthy Children Project, Inc.—(508) 888-8044—www.healthychildren.cc

- Training programs:
  - Maternal & Infant Assessment for the Lactation Consultant

Health Education Associates—(888) 888-8077—www. healthed.cc

- Documentation/guidance forms:
  - Anticipatory Guidance Documentation Form
  - Comprehensive Risk Assessment Tool for Breastfed Babies
  - Feeding Cues for Breastfed Babies & Mother's Daily Log
  - Infant Growth Charts for Breastfed Girls & Boys
  - Lactation Assessment and Comprehensive Intervention Tool (LAT)
  - Lactation Consult Notes for Mother and Baby
  - Postpartum Assessment Tool for Breastfed Babies
- Video: *Breasts & Breastfeeding: Common Early Concerns*

Lactation Institute—(818) 995-1913—www.lactationinstitute.org

- Lactation charting forms:
  - Phone History
  - Intake Form
  - Case Log Form
  - Maternal/Infant History
  - Notes
  - Breast and Infant Physical Assessment for Lactation
  - Instructions to Mother
  - Mother and Baby's Daily Log
- Educational slide series—More than 400 slides regarding breastfeeding and human lactation

Elizabeth C. Brooks JD, IBCLC—(215) 836-9088—ecbrks@yahoo.com

- HIPAA compliant forms

Creating Documentation

9

Introduction

Documentation and record keeping are important skills for those who care for lactating mothers and infants. The records should

- Be complete.
- Be clearly written.
- Be concise.
- Provide the assessor with a quick review to access during follow-up contacts with the mother and infant.
- Facilitate easy sharing of assessment findings with other healthcare providers for the continuity of care for the mother and infant.
- Allow assessors to research their own databank of similar cases, in order to review possible contributing factors and the success of strategies applied.

All records produced in the course of breastfeeding assessment are legal evidence of professional accountability. In case of malpractice claims, a complete and clear record provides solid evidence of the interaction with the mother and infant. Without documentation, interactions with mother and infant are assumed not to have occurred.

Documentation provides a means for continuous quality assurance/quality improvement.

The basic rules of record keeping

Assessors should assure that basic rules of record keeping are observed. These rules include the following:

- Record all interactions, however brief, with a mother and infant.
- Use permanent ink pen (not pencil) to record all notes.
- Correct any errors made in the process of writing the record only by drawing a single line through errors. The line should be initialed and dated to protect

against appearance of alteration of the record at a later date. Correction fluid and cover-up tape should never be used in counseling records. Errors discovered after the time of the interaction should not be corrected in the original record, but noted in the follow-up notes.

- Avoid use of excessive abbreviation and acronyms. If used, the record should contain a "key" to decoding the abbreviations and acronyms used.
- Record notes during the counseling session and write summaries as soon as possible after the session to preserve the integrity of the interaction.
- Date and sign all records.
- Keep original records for 7 years or longer. Assessors should consult with national and state law authorities to determine how long to retain records.

Obtain consent before the interaction

Before interacting with any mother and infant, the assessor should obtain the mother's consent verbally and in writing. The consent form should include the following:

- Information about the expected content of the assessment, for example,
  - Observing the mother and infant breastfeeding
  - Assessing the mother and the infant
  - Weighing and measuring of the infant
- Indication of the mother's consent to share assessment findings and treatment plans with the mother's and infant's healthcare providers

There are several legal and ethical issues related to informed consent. It is recommended that assessors seek information and counsel regarding these issues. An excellent resource is Bornmann's chapter "A legal primer for lactation consultants," in Walker, ed. (2002).

Note-taking during the interaction

Throughout all interactions with mothers, assessors should

- Record accurate notes.
- Identify significant findings.
- Identify key elements of the care plan.

Documentation of these findings and the plan is essential to professional practice.

Depending on the custom of the assessor's employer, specific documentation forms may be required or assessors may be able to purchase, adapt, or develop lactation documentation forms.

Intake information

The scope of practice ranges widely among breastfeeding assessors, including nurses, nutritionists, social workers, peer counselors, physicians, occupational ther-

apists, etc. For this reason, the type of assessment data and key data recorded will range widely among individual assessors.

Intake data collected should always include the following:

- Name of mother
- Reason for consultation
- Mother's mailing and street address
- Mother's home, mobile, and business telephone number
- Name of and contact information for mother's obstetric care provider
- Infant's name
- Infant's date of birth
- Infant's birth weight
- Name and contact information for infant's pediatric care provider
- Source of referral

Other information should be collected as necessary (e.g., insurance information if the assessor is billing insurance for lactation care).

History

Eliciting information of the mother's and infant's history is a crucial part of the assessment.

Maternal history can include pertinent information regarding the following:

- Postpartum period
- Labor and delivery
- Pregnancy and prepregnancy periods of the mother's life

The maternal history may also include previous pregnancies, labors, deliveries, and breastfeeding experiences.

Infant history can include pertinent information about the following:

- Fetal development
- Labor and delivery
- Postpartum periods

In gathering historical information, the assessor is searching for facts that can impact the current breastfeeding situation.

Assessment for breastfeeding performed during the prenatal period should include careful history taking (Powers & Slusser, 1997). Ask about the following:

- Feeding decision and previous feeding choices
- Previous postpartum hemorrhage, chest or breast surgery, breast trauma
- Breast changes during pregnancy
- Family history of breast cancer
- Maternal concerns about breasts and/or breastfeeding
- Examination of the breasts
- Communication of any concerns to other caregivers

- Inclusion of mother's partner and/or other pertinent family members in discussions
- Assessment of mother's awareness of professional and community support systems

Postpartum history could include the following additions:

- How are you feeling now?
- How was your pregnancy?
- Did you have difficulty conceiving?
- Any hormonal problems (thyroid, diabetes, etc.)? Are you currently taking any medications? Smoking? Drinking alcohol?
- Would you tell me about your labor and delivery experience with this baby (include pain relief methods used, procedures, etc.)?
- What happened immediately after the birth (procedures performed, skin-to-skin, vaginal bleeding, etc.)?
- What were the first feedings like?
- How are feedings going now?
- How do you know when it is time to feed the baby?
- How do feedings end?
- When did feeding difficulties begin?
- What do you think caused/causes these difficulties?
- When do the difficulties occur? Always? At a specific time of day, environment, infant state, etc.?
- What have you tried to improve the situation (pacifiers, pumps, other gadgets, other feeding strategies, etc.)?
- Would you "walk me through" the last 24 hours and tell me about your feeding and caring interactions with your baby?
- What are your goals regarding breastfeeding?

Lab reports

Relevant laboratory reports include results of medically ordered laboratory tests of physiologic conditions that could impact the breastfeeding situation. Examples of pertinent laboratory tests might include infant plasma bilirubin levels, mother's hematocrit, infant's blood glucose levels, and so on.

Key components of documentation

The important components of documentation during and after the assessment should include the following:

- Clear, concise notes taken during the course of the interaction with mother and infant. Items should include
  - Notation of mother's reason for visit.
  - Record of mother's and infant's history.

- Notes of observation of mother/infant interaction, including feeding.
- Notation of any measurements made or observed during visit, including weight, length, head circumference, ounces of milk expressed, formula given, etc.
- Record of all quantitative measurements made or noted during the visit (e.g., infant weight, volume of milk expressed, etc.).
- Notation of all activities performed (weighing, observing feeding, demonstrating altered positions, etc.) and all products used or suggested during the consultation (supplemental feeders, pumps, etc.).

- A summary tool (such as a preprinted report form, or use of SOAP and PIE notes, described later)
- Summary of instructions/suggestions made to mother or a photocopy or carbon copy of the actual instructions
- Indication of the follow-up plan, including planned telephone or meeting arrangements. Answering the following questions is helpful:
  - How soon is follow-up planned?
  - Who will contact whom?
  - What format will the follow-up take? Telephone? Visit?
- Indication of all referrals made by the assessor

Assessment and care-planning documentation

Several formats for assessment and care-planning documentation, including SOAP notes and PIE notes, are utilized in the health professions.

SOAP notes

The SOAP note was developed in the Problem Oriented Medical Record (POMR) system of data analysis and patient care planning and is used in many healthcare settings. The POMR begins with a collection of a database of information gathered through patient health history, then records each subsequent "problem" in SOAP note formation. The acronym SOAP denotes

S Subjective data. The situation or problem as stated in the mother's words. Many assessors record the mother's words verbatim in quotations.

O Objective data. Indication of any objective findings of the interaction: the infant's weight, length, pre- and post-feed weights, ounces of milk expressed by mother during the interaction, etc.

A Assessment. The assessor's assessment of the situation or problem.

P Plan. The care plan as agreed to by assessor and mother, as well as any referrals made and plans for follow-up.

Some healthcare systems use the acronym SOAPER, adding the following components to SOAP:

E Education. Special instructions, pamphlets, etc. given.

R Return. When and under what circumstances to return to assessor.

Other healthcare agencies use the acronym SOAPIER, adding the following to SOAP:

I Intervention. What actions were completed or suggested.

E Evaluation. Review and outcomes of the assessment, plan, and intervention.

R Reevaluation. Follow-up evaluation after a certain amount of time.

Sample documentation using SOAP notation

A sample SOAP note recording a lactation counseling session:

Mother: Jane Doe *Mother's Contact & Mailing Information:*

Infant: John Doe *Date of Birth:* June 18 *Current Age:* 2 weeks, 2 days

Location of Visit: LC Office *Time of Visit:* 10:15 a.m.–12:00 p.m.

Date of Visit: 7/5

S:

Mother states: "My infant has only wanted to nurse on my right breast since birth. That breast is making more milk. I don't think this is normal. My infant is gaining weight fine. I called my midwife about this and she said I should come and see you." Mother reports normal, uneventful pregnancy; "Ok" 12-hour labor, unmedicated, normal birth. First pediatric visit scheduled for 7/6. Mother reports 6–8 feeds q. 24 hrs. "Waiting for him to root to start feeds."

O:

Data recorded from infant immunization record: Birth weight 7 pounds, 3 ounces; Hospital discharge weight 6 pounds, 12 ounces (Day 2 of life)

Data recorded today:

Anthropometric: 7 pounds, 2 ounces—weight gain minus 1 ounce from birthweight, +6 ounces from discharge weight. Lowest weight unknown.

Visual: Marked discrepancy between mother's breast sizes is visually evident: left breast smaller than the right. More visible veins in right breast. Infant appeared active, not noticeably jaundiced.

Feeding observation: Suckling was sustained for 5 minutes on left breast, 13 minutes on right. Positioning at the breast was adequate, but not optimal. Pre- and post-feed weights show no measurable milk transfer on left breast, 2 ounces of milk transferred on right breast.

A:

1. Milk insufficiency?: Infant needs immediate pediatric follow-up to determine weight status and assess need for supplementation.
2. Weight gain marginal?
3. Additional milk expression may be required to increase milk supply; a milk expression plan was recommended.
4. Positioning and latch-on need improvement—deeper latch achieved during consult.

P:

1. Get weight checked on pediatrician's scale immediately. Appointment scheduled for 3:00 p.m. today.

2. Keep infant skin-to-skin and continue to observe infant for feeding cues, as shown. Goal of 10–12 feeds every 24 hours. Consider using feeding log to keep track.
3. Use loaner digital scale to determine milk transfer during three feedings today and three tomorrow.
4. If less than 2.5 ounces of milk are transferred in a feed, pump after the feed for 5–7 minutes per side, starting on the right, switching to the left for 5 minutes, then back to the right for 5 minutes. Feed expressed milk to the baby if supplementation is recommended by a physician, or store expressed milk in refrigerator for 48 hours or in freezer for a longer time period.
5. Continue improved positioning and latch, as shown.
6. Call LC later today to report physician's findings and schedule a follow-up consult. Continue to call LC, pedi, and midwife whenever questions arise.

Date of Visit: 7/5 *Signature: Lactation Consultant*

PIE format notes

PIE is an acronym for problem-intervention-evaluation. The PIE format differs from the SOAP format in that the narrative does not include assessment information. Special flowcharts are used to record assessment data. The acronym PIE denotes the following:

P Problems applicable to client

I Interventions or action taken

E Evaluation of the outcomes of interventions applied and the client's response to the interventions

Sample documentation using PIE format (based on case in SOAP note above)

P:

- Minimal infant weight gain due to insufficient feeding practices and possible insufficient milk supply.

I:

- Assisted client to position infant during latch-on process. Discussed with the mother frequency of feedings and impact on milk supply.
- Encouraged mother to continue to watch for feeding cues with goal to increase feedings to 10–12 per 24 hours.
- Instructed mother to contact pediatrician for weight check and assessment.
- Loaned mother digital scale to perform pre- and post-feed weights 3X today and tomorrow.
- Instructed mother to pump after any feed in which less than 2.5 ounces of milk is transferred. Pumping routine recommended consisted of 5–7 minutes of pumping on the right breast, switching to 5–7 minutes on the left breast, and then returning to 5–7 minutes on the right breast. Instructed mother to store breastmilk in the refrigerator for 48 hours or in the freezer if milk is to be kept longer.

- Encouraged mother to call LC with results from pediatric appointment and to schedule follow-up visit.

E:

- Infant was successful in achieving a deeper latch, taking in more breast tissue as he nursed.
- Mother verbalized understanding of relationship to increased feeding and increased milk supply.
- Mother agreed to continue watching for feeding cues as signal to feed infant and will attempt to reach goal of 10–12 feedings per 24 hours.
- Appointment scheduled for pediatric visit today at 3:00.
- Mother verbalized understanding of how and when to use digital scale.
- Mother verbalized understanding of how and when to use a breast pump.
- Mother verbalized understanding of milk storage instructions.
- Mother agreed to call LC with results from visit to pediatrician and to schedule follow-up visit with LC.

Assessment information regarding feeding observation, breast observation, infant's weight, and so on would be documented on a separate form.

Follow-up and progress notes

Follow-up and progress notes should be made in similar format (SOAP or PIE) to the original assessment format. All follow-up contacts should be briefly, but thoroughly, recorded.

Breastfeeding consultation reports to other healthcare providers

When breastfeeding assessment interactions occur outside the hospital, birth center, or office of a healthcare provider (pediatrician, obstetrician, family practitioner, or midwife), the assessor should send a report summarizing the interaction to the pertinent healthcare provider within 24 hours. It is essential that written maternal consent and permission to release records have been obtained during the interaction.

Sample format of a report to healthcare provider

LC Practice
Address
Phone & Fax
Breastfeeding Assessment Report

Healthcare Provider Report

To: *Dr. Pediatrician*
Nurse-Midwife
From: *LC*
Date: 5 July

Re: Infant *John Doe, d/o/b 6/18*
Mother *Jane Doe, d/o/b 12/6/80*

Subjective:

Her midwife referred Jane Doe, mother of infant John, regarding her breastfeeding concerns. At initial contact today, 7/5, Ms. Doe had questions about the normalcy of one-sided breast preference for the infant, reporting that her right breast was secreting much more milk than the other. She reported that her infant was gaining weight appropriately.

Objective:

- Anthropometric: 7 pounds, 2 ounces today—a weight gain of –1 ounce from birth weight, +6 ounces from discharge weight at 2 weeks, 2 days of age. Lowest weight unknown.
- Visual: Marked discrepancy between mother's breast sizes is visually evident: left breast smaller than the right. More visible veins in right breast.
- Feeding observation: Infant appeared active, not noticeably jaundiced, and was able to sustain suckling for several minutes. Positioning at the breast was adequate, but not optimal. Pre- and post-feed weights using a digital scale with milk intake function showed no measurable milk transfer on left breast, 2 ounces of milk transferred on right breast. (NB: Neither measurement is indicative of milk supply, as one test weight cannot determine the adequacy of mother's milk supply.)

Assessment:

1. Milk insufficiency? Infant needs immediate pediatric follow-up to determine weight status and assess need for supplementation.
2. If inadequate milk supply is diagnosed, mother may wish to initiate pumping to increase supply.
3. Positioning and latch-on need improvement.

Plan:

1. Same-day pediatric visit scheduled for 3:00 p.m. today.
2. Digital scale was loaned to mother to track milk intake at the breast over the next several days.
3. Pumping regime was suggested: Pump as often as possible for 5–7 minutes per side, starting on the right, switching to the left for 5 minutes, then back to the right for 5 minutes. Stored milk may be used to supplement infant, if needed.
4. Improvements to positioning and latch were demonstrated, including allowing more head extension so infant can grasp more of the breast tissue, and were recommended.
5. Mother was encouraged to contact Center, pediatrician, and midwife as needed for further information or assessment.

Please contact me if I can provide further information.

LC signature *Date*

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Appendix A

Estimating Milk Transfer

Milk transfer can be assessed by weighing the infant before and after nursing using a digital scale that is sensitive within 2 grams.

- Never leave infant on the scale unattended.
- Be sure the scale is plugged in.
- The infant is dressed, preferably with a new diaper. The infant does not need to be naked because this process is used to estimate milk intake, not to verify weight.
- Do not change the infant's diaper between the two weight checks.
- Do not change the infant's clothing (note if the infant is wearing hats, socks, mittens, or other clothing).
- If there is a diaper change or clothing change during the feed, the postfeeding weight cannot be used to estimate milk transfer because it will not be as accurate.

Following is the procedure to be followed for accurate weighing using a digital scale:

1. Turn on the scale.
2. Place a liner in the scale bed (if used).
3. Zero the scale. Make sure that the indicator notes "0".
4. Place the infant on the scale.
5. Record the exact weight of the infant.
6. Lift the infant off the scale.
7. The mother nurses the infant.
8. Place the infant back on the scale, assuring that all the clothing (hats, shirts, receiving blankets, etc.) that were worn during the first weight are worn or placed on the scale.
9. Record the exact weight of the infant.
10. Subtract the prefeeding weight from the postfeeding weight. This will indicate the approximate amount of milk transferred. (If you are using a scale designed to calculate milk intake, this calculation is unnecessary.)

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Appendix B

Technique for Manual Expression of Milk

Many women who learn manual (hand) expression find that it is easier and faster than a mechanical pump. All that is needed is a clean container to catch the milk and clean hands.

Wash your hands.

Optional: Massage your breasts before beginning to express milk.

Breast massage consists of stroking the breast gently but firmly.

Stroking motions should work milk toward the nipple.

The hands may be rotated to different quadrants of the breast to get milk flowing from all sections.

Each breast may be massaged several times.

Stretching the nipple to help milk to flow.

Place the thumb and forefinger (index finger) on the areola.

Push the breast tissue back toward the chest wall and press the thumb and forefinger together gently.

Note: Sliding the fingers across the skin may cause pain and tissue damage and should be avoided.

Maintain the compression until no more milk comes out.

Rotate the position of the thumb and fingers to other sections of the breast and continue to express until the milk ceases flowing and comes out only in an occasional drop.

Switch breasts and repeat the massage and expression process, or use two hands to express from both breasts simultaneusly.

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Glossary

abrasion: an area of skin that has been rubbed or worn away
abscess: a small pocket of pus within the body formed by breakdown of cells. The area around an abscess is typically inflamed.
accessory breasts: extra breast tissue on the body
AGA: appropriate for gestational age
alternative feeding methods: devices (such as bottles, supplementers, cups, etc.) used to deliver expressed human milk or formula to an infant
alert: a state of awakeness and activity
alveoli: small glands in the breast that produce breastmilk
anemia: a condition in which the blood is deficient in red blood cells, in hemoglobin, or in total volume. Iron deficiency anemia is a common form of anemia.
anomaly: an unusual condition that is outside normal range
AOM: acute otitis media (middle ear infection)
apnea: temporary cessation of breathing
areola: darkened area of skin surrounding the nipple
artifact: an item produced by human beings
artificial nipples: bottle nipples made of silicon, rubber, or other materials
at-breast supplementer: fine plastic tubing, with one end attached to a container holding expressed human milk or formula, and the other end taped to the breast

BF: breastfed, breastfeeding
bilateral: two-sided
bilirubin: by-product of the breakdown of the hemoglobin portion of red blood cells
blocked milk duct: milk from one part of the breast does not flow well and forms a lump of thickened milk that blocks the milk duct
bolus: referring to a ball-shaped volume of milk that is swallowed
breast abscess: area in the breast that feels hot and painful and is full of fluid; It results from untreated mastitis.
breastmilk jaundice: jaundice that is believed to be caused by the mother's breastmilk. The cause of breastmilk jaundice is unknown and the incidence is less than 1 percent.

Candida: a family of parasitic fungi occurring especially in the mouth, vagina, and intestinal tract. They are the causative agent (*C. albicans*) of thrush.

casein: the fraction of milk protein that forms the tough curd
choanal atresia: a congenital blockage of the nasal airway
cleft lip: a congenital birth defect causing division or split in the lip
cleft palate: a congenital birth defect causing a division or opening in the roof of the mouth
CMV: cytomegalovirus
colic: abdominal pain and discomfort accompanied by excessive crying and irritability in the infant
colostrum: the first milk, produced in the breasts by the seventh month of pregnancy. Colostrum is thick, sticky, and clear to yellowish in color; high in protein and vitamin A; laxative effect helps the baby to pass meconium. Immunoglobulins (mostly IgA) in colostrum provide an anti-infective protection to the baby.
compensation: the process of balancing or making up for a deficit or challenge
compression: the application of positive pressure
congenital: a condition that is present from birth
contact dermatitis: a surface reaction to a substance that has been touching the skin
contraindication: a condition or factor that makes something inadvisable
Cooper's ligaments: the triangular-shaped ligaments underlying the breasts
copious: an ample amount
cradle hold: breastfeeding position in which the mother holds the baby on her lap with his/her head resting on mother's forearm directly in front of the breast (aka "Madonna Hold")
cyst: a sac-like growth within the body

dancer hand position: technique that supports the breast and baby's chin to stabilize the baby's jaw and maintain good attachment throughout a feed. The mother gently cups the baby's chin between her thumb and first finger, and cups the remaining three fingers under the breast along with the palm of the hand.
dermatitis: inflammation of the skin
Down Syndrome: a congenital condition characterized by moderate to severe mental retardation; also called Trisomy 21

EBF: exclusively breastmilk fed
EBM: expressed breastmilk
ectopic: outside of the usual location
eczema: a noncontagious inflammation of the skin, characterized chiefly by redness, itching, and the outbreak of lesions that may become encrusted and scaly
edema: excessive swelling of tissue
ELBW: Extremely low birth weight infant, birthweight <1,000 g (2.2 pounds)
engorgement: swelling in the breast that blocks milk flow, caused by inadequate or infrequent milk removal. The breast will be hot and painful, and will look tight and shiny. With severe engorgement, milk production may stop.
epithelium: skin or skin-like lining of the digestive, respiratory, and genito-urinary tract
erosion: wearing away of skin

erythema: reddening
etiology: all of the causes of a disease or abnormal condition
exclusive breastfeeding: the baby is given no drinks or foods other than breastmilk, and no pacifiers or artificial nipples

fatigue: sleepiness or exhaustion
FF: formula fed
fibrocystic: characterized by presence of fibrous tissue and cysts
fissures: cracks or breaks in the skin
flexion: curled or bent
foremilk: the milk present in the breast at the beginning of a breastfeed failure
FTT: to thrive

galactocele: a cyst within the breast that retains milk
galactopoiesis: the development of milk in the mammary gland and the maintenance thereof
gape: wide opening of the mouth
gastrointestinal: having to do with the stomach and intestinal tract
gavage: fed via a tube that is inserted through the nose or mouth into the stomach
gestational: pertaining to the period of pregnancy or fetal growth
GI: gastrointestinal
gigantomastia: massive overgrowth of the breasts triggered by hormones
glands of Montgomery: small glands in the areola of the breast that become more marked in pregnancy and secrete a fluid that lubricates the nipple area
Goldsmith's sign: refusal to feed on one breast that has been associated with later diagnosis of breast cancer in some women
guaiac: a test for the presence of blood

hematoma: a localized swelling filled with blood
herpes: a family of infectious viruses
hindmilk: the milk in the breast toward the end of a feed
HIV: a group of retroviruses and especially HIV-1 that infect and destroy helper T cells of the immune system causing the marked reduction in their numbers that is diagnostic of AIDS; called also AIDS virus, human immunodeficiency virus
hives: a swollen patch of skin that is itchy
HOM: higher order multiples (quads+)
HSV: Herpes simplex virus, an infection that can be fatal to the neonate
hydrolysate formula: formula in which proteins are chemically broken down by hydrolysis (a reaction in which water is used to split amino acids)
hyperbilirubinemia: high levels of bilirubin in the blood
hyperinsulinemia: the presence of excess insulin in the blood
hyperpigmentation: increased coloration of the skin
hypertonic: tight muscle tone (stiff)
hypoglycemia: low blood sugar
hypotonic: low muscle tone (floppy)

IDDM: insulin dependent diabetes mellitus
impetigo: a skin infection characterized by honey-colored crusts

infant: a child under one year of age
inflammation: a localized reaction of tissue to the presence of items perceived to be foreign, or other irritation, injury, or infection, characterized by pain, redness, and swelling
inverted nipple: nipple that turns inward when stimulated

jaundice: condition that results when red blood cells break down faster than the liver can handle, causing a yellow color of the skin. In the newborn, normal physiologic jaundice is caused by the immaturity of the liver.

labial: pertaining to the lip
lactiferous duct: see *milk duct*
lactoferrin: iron-binding protein whose presence in human milk inhibits the growth of microorganisms in the gut
lactogenesis: stages of development of the milk production process
lanolin: an ointment made from wool fat
LBW: low birth weight infant, less than 2,500 g (< 5.5 lbs, 8 oz)
L&D: labor and delivery
let-down reflex: the milk ejection reflex; the spontaneous ejection of milk from the breast
lethargy: weakness, inactivity
LGA: large for gestational age
lingual: pertaining to the tongue
lipoma: a fatty growth
lobes, lobule: sub-units of the glandular tissue of the breast
lochia: discharge from the uterus after birth
lymphocyte: a type of white blood cell, that includes the cellular mediators of immunity

mastitis: inflammation in the breast causing localized tenderness, redness, and heat. Mother may have a fever, feel tired, achy or nauseous, or have a headache. Mastitis may or may not be an infective process.
meconium: first stool of a newborn, varying from greenish black to light brown with a tarry consistency
micrognathia: abnormal shortness of the jaws
milk duct: narrow tube structure that carries milk to the nipple
milk ejection reflex: reflex initiated by the production of the hormone oxytocin, which causes the contraction of myoepithelial cells, ejecting milk from the milk ducts
Montgomery glands: see *glands of Montgomery*
morbidity: the incidence of disease
mortality: death
Multipara ("**multip**"): a woman who has given birth to multiple babies
myoepithelial cells: smooth muscle cells that encircle the alveoli and ducts of the breast. Contraction of these cells causes the outward flow of milk.

necrosis: death of cells
neonate: a newborn infant, typically characterized as a baby less than 4 weeks.
neurologic: pertaining to the nerves and nervous system

neuromuscular: pertaining to the interaction of the nerves and muscles
nipple: the highly colored and protruberant skin at the tip of the breast
nipple shield: typically, a silicon or latex device that covers the nipple
non-nutritive sucking: suckling that causes little or no milk secretion
normal fullness: breast fullness that occurs when the milk is "coming in." Extra blood and lymph is brought to the breast. The breasts may feel warm, full, and heavy.

obturator: dental plate that fits over a cleft in the hard palate and aids breastfeeding
otitis media: middle ear infection
oxytocin: hormone that contracts the cells around the alveoli and sends milk down the ducts to the nipple

pacifier: an artificial nipple used to soothe babies
palate: the roof of the mouth
patent: connected, open
perinatal: around the time of birth, both pre- and postpartum
premature: born early (before 37 weeks gestation)
primipara ("**primip**"): a woman who is giving birth for the first time
prolactin: hormone that stimulates the production of milk
prolactin inhibitory factor: factor in the bloodstream that suppresses the action of prolactin
prolactin inhibitory factor inhibitor: factor in the bloodstream that suppresses the action of prolactin inhibitory factor, thus allowing prolactin to influence the cells of the mammary gland
psoriasis: an inflammatory skin disorder characterized by recurring reddish patches with silver scales. Psoriasis is noncontagious.
pump: a device used to remove milk from the breast

rash: eruption on the skin
Raynaud's phenomenon: vasoconstriction and reduced blood flow to an extremity of the body in response to cold stress.
relactation: reestablishing adequate milk production in a mother who has a greatly reduced milk production or who has stopped breastfeeding
rooting reflex: natural instinct of the newborn to turn his head toward the nipple and open his mouth when mouth area is gently stroked with the nipple

satiety: fullness, satisfaction
serology: bloodwork
SGA: small for gestational age
SIDS: sudden infant death syndrome
SNS: supplemental nursing system, a type of at-breast supplementer
stimuli: something in the environment that causes a response
submucosal cleft: a cleft of the hard palate that is covered by skin and thus not visible on visual inspection of the infant's palate
sucking: drawing into the mouth by forming a partial vacuum with the lips and tongue, as in sucking on an artificial nipple
supernumerary: greater in number than is normal

supplementation: food other than breastmilk that is given to an infant to replace or increase calories consumed at the breast
symmetry: exact correspondence of form or function

tandem nursing: nursing two or more children not of the same pregnancy (e.g., a newborn and a toddler)
TE fistula: tracheal esophageal fistula; abnormal opening between the trachea and the esophagus
teat: the combination of nipple and breast tissue that is drawn into the infant's mouth
thrush: infection caused by the yeast *Candida albicans* that the baby may contract through the birth canal. It may produce white patches and ulcers in the baby's mouth. The baby may then transmit the oral infection to the mother's breasts.
Trisomy 21: see *Down Syndrome*
tubercle: a small, round protrusion from the surface

unilateral: one sided

vasospasm: sudden constriction of a blood vessel
VLBW: Very low birthweight infant weighing less than 1,500 g (3.3 pounds)

whey: a protein component of milk. These proteins are easier to digest than caseins.
WNL: within normal limits

yeast: a fungal organism

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COLOR PLATE 2–1 Breaking the seal prior to removing infant from breast
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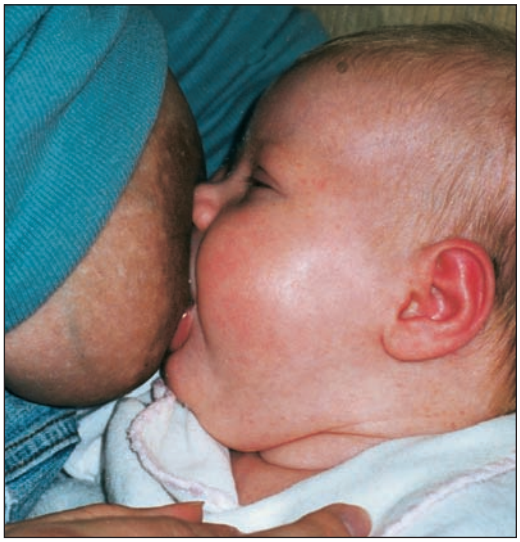

COLOR PLATE 2–2 Bottom lip flanged out and back, upper lip flanged out
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COLOR PLATE 2–3 Mom's view of football hold with preterm twins
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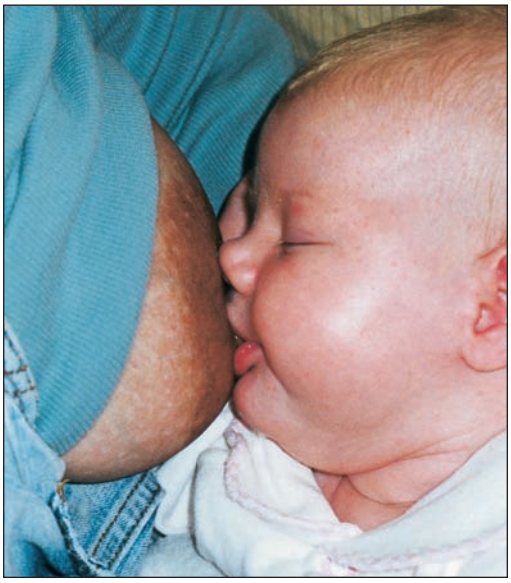

COLOR PLATE 3–1 Narrow gape
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COLOR PLATE 3–2 Head tilted too far forward pushes nose into breast
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COLOR PLATE 3–3 Clamping the jaw and pursing the lips
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COLOR PLATE 3–4 Infant with very receding chin [Mandible]
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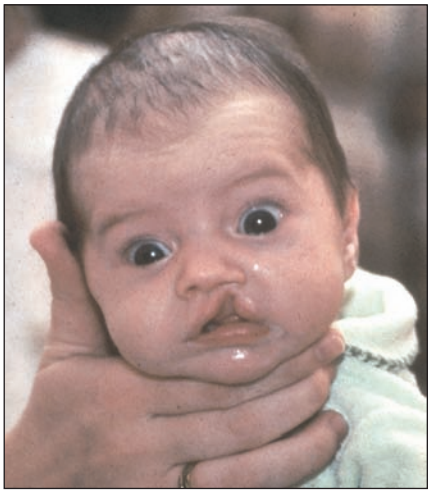

COLOR PLATE 3–5 Infant with unilateral cleft of lip and palate
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COLOR PLATE 3–6 Interior view-infant with unilateral cleft lip and palate
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COLOR PLATE 3–7 Infant with tight frenulum
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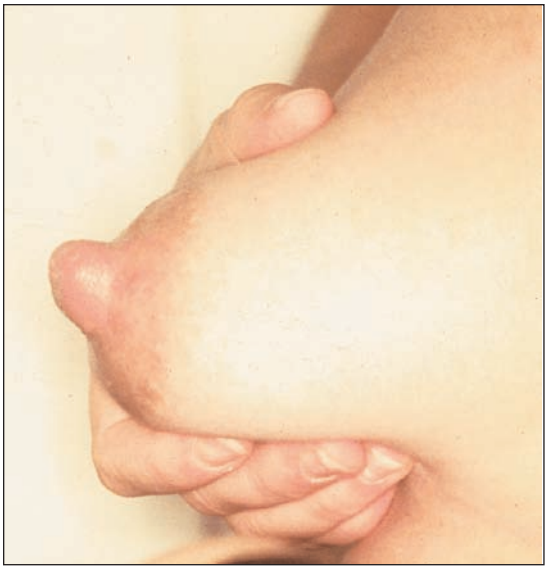

COLOR PLATE 3–8 Angled/beveled nipple just after breastfeeding
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COLOR PLATE 3–9 Precise digital scale for determining breastmilk intake
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COLOR PLATE 4–1 Infant showing avoidance behavior of finger splaying arm and leg extension
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COLOR PLATE 4–2 Newborn: physiologic flexion-13d
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COLOR PLATE 4–3 Premature infant skin-to-skin
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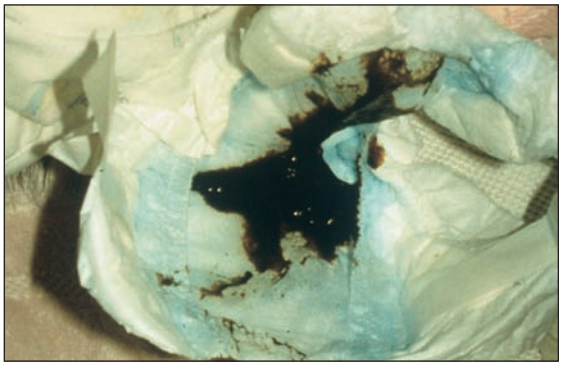

COLOR PLATE 4–4 Meconium in diaper
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COLOR PLATE 4–5 Transitional stool of a 4-day old, breastfed infant
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COLOR PLATE 4–6 Normal breastmilk stool
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COLOR PLATE 5–1 Jaundiced newborn
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COLOR PLATE 5–3 Cephalohematoma may affect infant's ability to suck correctly
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COLOR PLATE 5–5 Extreme arching in 2-month-old causing feeding problems and failure to thrive
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COLOR PLATE 5–2 Poor skin turgor in a 3-week-old
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COLOR PLATE 5–4 Hypotonic infant, failure to thrive and feeding problems
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COLOR PLATE 5–6 Uric acid crystals in diaper (brick dust urine)
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COLOR PLATE 5–7 Greenish stool
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COLOR PLATE 6–1 Veins of breast: lactating mother, 26 weeks postpartum, with prominent veining characteristic of lactation
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COLOR PLATE 6–2 Prominent Montgomery glands
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COLOR PLATE 6–3 From left: colostrum, breast milk, and artificial infant milk
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COLOR PLATE 6–4 Woman expresses a drop of milk
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COLOR PLATE 7–1 Super-numerary nipple on left areola
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COLOR PLATE 7–2 Insufficient glandular tissue
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COLOR PLATE 7–3 Indentation mark from a too-tight bra
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COLOR PLATE 7–4 Reaction to breast "comfort" device
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COLOR PLATE 7–6 Right breast funtioning normally in spite of implant; left breast painfully enlarged
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COLOR PLATE 7–7 Very poorly fitting bra is likely to interfere with milk drainage
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COLOR PLATE 7–8 Abcessed area in left breast
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COLOR PLATE 7–10 Bruising of breast at 11 o'clock position from infant latching to breast instead of nipple
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COLOR PLATE 7–11 Periareolar incision/scar
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COLOR PLATE 7–12 Bleb following trauma in Plate 7-10
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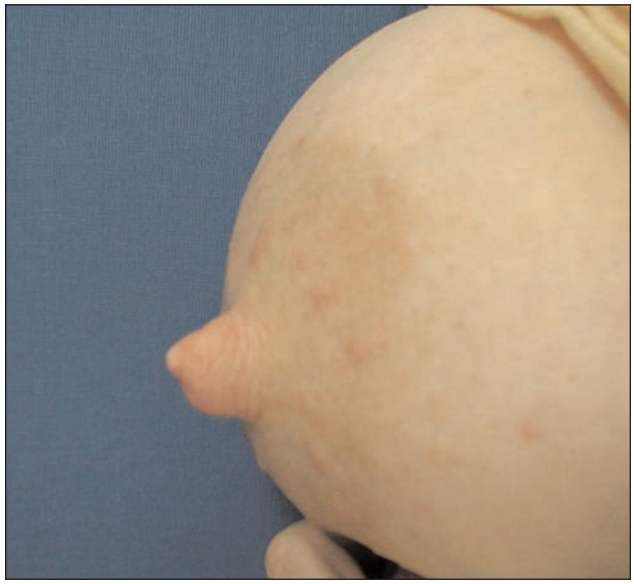

COLOR PLATE 7–13 Same bleb in profile
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COLOR PLATE 7–14 Bleb immediately after lancing procedure
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COLOR PLATE 7–15 Bleb 5 minutes after lancing procedure
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COLOR PLATE 7–16 Herpes on nipple
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COLOR PLATE 7–17 Unilateral mastitis
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COLOR PLATE 7–18 Contact dermatitis
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COLOR PLATE 7–19 Contact reaction to pump shield
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COLOR PLATE 7–20 Pink candida sheen and on nipple and areola
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COLOR PLATE 7–21 Stretch marks on the breast
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COLOR PLATE 7–22 Inverted nipple before feeding
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COLOR PLATE 7–23 Inverted nipple after feeding
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COLOR PLATE 7–24 Raspberry nipple
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COLOR PLATE 7–25 Cracked nipple from improper positioning
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COLOR PLATE 7–26 Raynaud's phenomenon of the nipple (nipple vasospasm) note temporary whiteness of nipple
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COLOR PLATE 7–27 Raynaud's phenomenon, color returns to the nipples
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COLOR PLATE 7–28 Raynaud's phenomenon: close-up of color changing on nipple tip.
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COLOR PLATE 7–29 Raynaud's phenomenon: Vasospasm during pumping session
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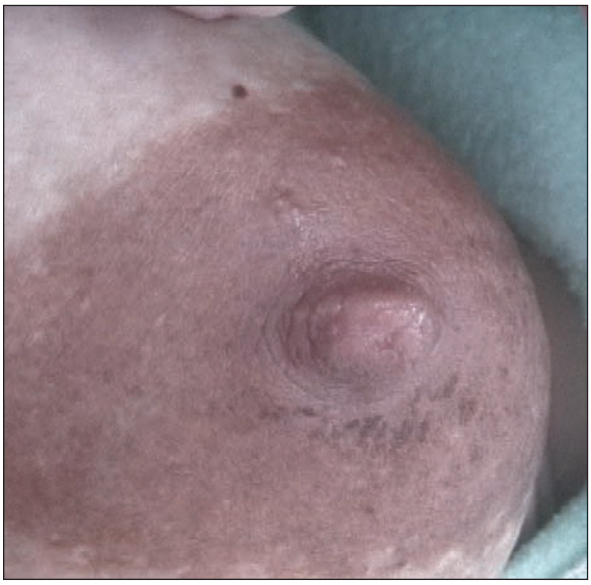

COLOR PLATE 7–30 Nipple with white compression line from small mouth angle
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COLOR PLATE 7–31 Rusty pipe milk
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COLOR PLATE 8–1 A selection of breast pumps
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COLOR PLATE 8–3 A selection of infant feeding devices
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COLOR PLATE 8–4 Cupfeeding preterm infant
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