8

EVOLUTIONARY OBSTETRICS

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Many current challenges to human health and well-being can be accounted for by the inconsistencies between the environments in which we live today and those in which human physical, emotional, and psychological needs evolved. An extreme example is the contrast between childbirth as experienced by our ancestors and by women in industrialized nations delivering their infants in modern hospital labor and delivery suites. In particular, the technology associated with childbirth and the social environment in which birth takes place are two areas of difference between past and present that will be examined in this chapter. Contemporary criticisms of "high-tech birthing" are presented,[1] and ways in which birth technology could be made to align with a woman's emotional needs are suggested. My argument is that the roots of social support during labor and delivery are as ancient as the human species itself, and that one of the reasons for dissatisfaction with the way in which childbirth is practiced in many industrialized nations is the failure of the medical system to acknowledge and work with the evolved emotional needs of women at this time. Providing social and emotional support during labor and delivery may improve both physical and emotional outcomes and lead to more positive perceptions of the birth experience.

Birth Technology: Past and Present

As with any area of health care, one of the major differences between past and present childbirth practices involves changes in the use of technology. Table 8.1 summarizes practices of contemporary birth technology in the United States, comparing each with probable historical practices in maternity care. Current hospital deliveries ("twenty-first century birth technology") may in-

Table 8.1 Technology of childbirth

21st Century birthing technology	Intended to	Implicated in	Low-tech alternative	Reference
Intravenous oxytocin	Augment or induce labor	High dystocia incidence; high rates of cesarean section	Manual breast stimulation; waiting	Curtis (1993)
Electronic fetal heart monitor	Monitor fetal heart rate; reduce perinatal mortality and morbidity	High rates of cesarean section and maternal infection	Visual and aural monitoring (intermittent)	Shy et al. (1990); Freeman (1990)
Medications to reduce sensations of pain	Reduce stress on the laboring woman	Fetal stress; numerous side effects for mother and infant	Reassuring presence; breathing techniques	Brackbill et al. (1984)
Enema, shaving of pubic hair	Reduce risk of infection	Increased risk of infection; discomfort	No enema (women often have natural diarrhea in labor), no shaving	Davis-Floyd (1992); Brackbill et al. (1984)
Lying down in labor	Ease of monitoring labor progress	Interruption of blood flow and oxygen to fetus; discomfort; increase length of labor, decreased strength of contractions	Walking; movement at will	Davis-Floyd (1992)
Lithotomy position for delivery	Ease of assisting in delivery, especially if instruments are used	Lengthens second stage of labor; less effective pushing	More upright posture, such as squatting or sitting	Sleep et al. (1989)
Episiotomy	Enlarge vaginal canal; reduce chances of perineal tears, uterine prolapse, etc.	Pain and discomfort; infection	Perineal massage; slow, controlled delivery of head	Banta and Thacker (1982); Mynaugh (1991)
Cesarean section	Alleviate problems from dystocia and fetal distress	Excessive expense of maternity care; related morbidity and mortality	Reduce incidence of cesarean section deliveries	Marieskind (1989)

clude one or more of the following practices: induction or augmentation of labor with intravenous oxytocin, use of electronic fetal heart-rate monitors, medication to reduce pain, maintenance of a "sterile field," supine posture during labor and delivery, episiotomy, use of forceps, and cesarean section. Each of these procedures is meant to reduce mortality and morbidity and/or to facilitate the ease with which health care providers assist women in labor and delivery. Unfortunately, several of the routine and expected practices in hospital deliveries are occasionally linked to increases in morbidity and mortality (see Brackbill et al., 1984, for a review). Coupled with general feelings of dissatisfaction on the part of recipients of maternity care (see, e.g., Kyman, 1991), concerns about overreliance on technology have led to calls for changes in the ways normal deliveries are managed in the United States, and increasing numbers of requests for "natural childbirth," which are referred to in table 8.1 as "low-tech alternatives."

Until the early twentieth century in the United States, and in many cultures today, pregnancy care, labor, and delivery were the province of women, with midwives providing the needed services. Most scholars of the history of medicine cite the invention of the forceps in 1588 by Peter Chamberlen as the beginning of the transformation of childbirth from a home-based "healthful" event supervised by midwives to a hospital- or clinic-based *medical* event under the control of medical specialists (Mitford, 1992). That transformation from home to hospital was not complete, however, until the middle of the twentieth century (Devitt, 1977). Only 5% of all American births occurred in hospitals in 1900, but by 1970, virtually all births in the United States were in hospitals (Wertz and Wertz, 1989). In 1994, 99% of U.S. births occurred in hospitals (Guyer et al., 1995). Rationale for the claim that hospitals were the normal and expected place for childbirth included safety, sterility, ease of monitoring, efficiency, and proximity to emergency equipment. These rationale were behind the emergence of what Mitford (1992) calls "the American way of birth."

One issue that concerns modern obstetrics is time. Any review of an obstetric text will highlight the expected length of gestation and of normal labor and delivery and will note the points at which the bounds of the norm are exceeded, calling for intervention. This intervention is usually designed to induce labor or to speed up labor or delivery.[2] Common methods used include amniotomy (rupture of the amniotic sac and membranes) and administration of intravenous oxytocin to induce uterine contractions. Neither of these practices is without risks. Amniotic fluid helps to cushion the fetal head during early contractions and serves to protect the umbilical cord. Once the membranes are ruptured, risks of infection increase. Exogenous oxytocin administration has been implicated in fetal distress, uterine rupture, extremely painful and powerful contractions, increased maternal stress and anxiety, and increased reliance on pain medication (Davis-Floyd, 1992). The "low-tech" option is to wait until labor begins and to avoid dependence on arbitrary time limits for its progression, unless there are clearer indicators of the need for intervention.

One of the primary functions of birth attendants, past and present, is to monitor the health and state of the mother and fetus. In the past this required spending time with the laboring woman, listening to fetal heart tones, and talking with the woman to assess her status. Internal and external electronic fetal monitors (EFM) were designed to improve the ability to detect abnormalities in fetal heart rate that indicate fetal distress and that require intervention, thereby reducing perinatal morbidity and mortality. Although their use has become almost routine in hospital deliveries in the United States,[3] there is no evidence that EFMs have contributed to a reduction in morbidity and mortality (Brackbill et al., 1984; Freeman, 1990; Prentice and Lind, 1987). In fact, they have consistently led to an increase in rates of cesarean section, which is associated with greater morbidity and mortality for mothers and infants (Brackbill et al., 1984). One reason for the increase in cesarean section rates associated with EFM use is that the monitors detect subtle changes in fetal heart rate during uterine contractions, changes that are often normal responses to the contractions (Lagerkrantz and Slotkin, 1986). Lagerkratnz and Slotkin (1986:103) observe that normal labor can "cause alterations in heart rates that might well be misinterpreted as signals of fetal distress." These misinterpretations often lead to decisions to deliver the infant by cesarean section. Furthermore, most studies conclude that EFMs are no more effective at detecting fetal distress than manual monitoring with a fetoscope (Haverkamp and Orleans, 1983). Thus, the low-tech alternative of watchful waiting is at least as effective as the high-tech option, at far lower expense and without restricting a woman's freedom of movement in labor.

Another way in which modern deliveries in the United States differ from those in the past is the position the woman assumes for delivery. The lithotomy position, commonly used for delivery in the United States, is one in which a woman lies flat on her back with her legs up in stirrups. This position is apparently good for the birth attendant, but may be less than optimal for the parturient. Studies by Caldeyro-Barcia (1979) suggest that an upright position (standing, squatting, sitting) is better than the supine position because the cervix dilates more effectively and contractions are stronger and more efficient. One reason for these differences is that the expulsive efforts of the contractions work with gravity in dilating the cervix and in delivering the infant. Furthermore, when a woman is upright, the presenting part (usually the back of the infant's head, the occiput) bears most of the force of the contractions. The occipital bone is the most developed of the cranial plates at birth and can best absorb this stress (D'Esopo, 1941). When a woman is lying down for delivery, the force of the infant's body must be absorbed by the more fragile frontal bones that lie against her sacrum. If the fetus is lying with the back of the head against the mother's sacrum (i.e., in a posterior position), the stress will be applied to the base of the skull, close to the spinal cord (D'Esopo, 1941). Babies delivered by their mothers in the upright position show fewer abnormal heart rate patterns and have higher Apgar scores at birth (Sleep et al., 1989).

Women in many cultures of the world deliver in an upright position. Naroll and coworkers (1961) reviewed birth position in 76 non-European cultures

and found that the upright position was stated or implied for 62. Upright delivery postures includes sitting, squatting, kneeling, and standing. Often advocated by midwives is the squatting position, which increases the diameter of the pelvic outlet by as much as 0.5–2.0 cm. (Golay et al., 1993; Russell, 1969). In a study of 200 squatting births compared with 100 semirecumbent births, squatting women required significantly less oxytocin stimulation ($p<.01$) and fewer episiotomies ($p<.0001$) (Golay et al., 1993).

Unlike women in many cultures, however, most American women are not accustomed to performing daily activities while squatting and find it difficult to deliver in this position without assistance. Thus, although it may be the position with the longest history (most nonhuman primates deliver in the squatting position), it is often not compatible with twenty-first century lifestyles in the United States. Sitting, however, is something that Americans do especially well. Many hospitals have incorporated the use of a birthing stool into their delivery options, or women are simply allowed to deliver in a sitting or reclining position on a bed. These semi-upright positions probably represent a reasonable compromise between the ideal position for delivery and one which is practical.

The potential for contamination is of great concern in modern obstetrics. One of the major causes of neonatal and maternal mortality throughout human history has been sepsis. The source of "childbed fever" was first recognized by Semmelweis in 1846, who observed that mortality was much higher for women delivered by physicians than for those attended by midwives (Mitford, 1992). Physicians often came to deliveries following their ministrations to sick people or following autopsies, without washing their hands, thus transferring infectious agents to otherwise healthy women. Most physicians were angered by the suggestion of Semmelweis that they were the sources of childbed fever (see Mitford, 1992, for a review). Notably, in the last century, deaths from childbed fever were much higher in hospital maternity wards than among home births. At one point in the late nineteenth century, it was even recommended that in order to avoid the dangers of sepsis associated with hospital births, all births should take place at home (Oakley, 1984).[4] In the 1930s, the drug prontosil was found to be useful in the battle against childbed fever, although the decline in virulence of the infection appears to have preceded the use of the drug (Oakley, 1984). Perhaps childbed fever is another example of coevolutionary processes leading to reduced virulence of a disease (see Ewald, this volume). Today the problem has been almost entirely eliminated in some parts of the world through the use of antibiotics and improved hygiene measures.

Despite the fact that childbed fever has not been a major concern since the middle of this century, and despite the evidence that home environments in the United States are no more dangerous as sources of infections than hospitals (indeed, the opposite may be the case; see Brackbill et al., 1984, for a review), concern for contamination (sterile technique) during the birth process has assumed major importance in contemporary hospital births. This concern about contamination is the rationale behind restricting access to the laboring woman,

using hospital gowns, administering an enema before delivery and shaving the pubic area ("prepping"). Each of these (nonmedical personnel, street clothes, diarrhea, pubic hair) is seen as a potential source of contamination. Davis-Floyd (1992), Brackbill et al. (1984), and others argue that there is no scientific evidence that any of these procedures reduce infection. Itching and other discomforts while pubic hair is growing back contribute to problems in the postpartum period. Enemas are uncomfortable and do not appear to shorten labor, as is often claimed (Romney and Gordon, 1981). Exposure to fecal matter is likely to occur, whether an enema is used or not.

Many women interviewed by Davis-Floyd (1992) reported feelings of discomfort and embarrassment resulting from the practices to which they were subjected upon entering the hospital, most especially being separated from their families, being dressed in hospital gowns, being given enemas, and being shaved. Considering the near absence of evidence that any of these effectively reduce infection, it is reasonable to argue against their routine use in normal labor and delivery. In this case, the alternatives of no separation from family, comfortable clothing, no shaving, and no enemas seem acceptable.

Another routine practice associated with deliveries in the United States is episiotomy, the cutting of the perineum (the tissue and skin between the vaginal opening and the rectum), which has been cited as the most commonly performed surgery on women in the United States (Rothman, 1993). According to the National Center for Health Statistics, the episiotomy rate in the United States in 1990 was 55.8 per 100 (Labrecque et al., 1994). In a study of practices associated with low-risk deliveries in five hospitals in the United States, episiotomy rates ranged from 53.7% to 74.5% (Hueston et al., 1995). The purpose of this minor surgical procedure is to enlarge the vaginal opening and ease the passage of the infant from the birth canal. Other rationale for this practice include reducing the incidence of uncontrolled tearing of the perineum and preventing later "pelvic relaxation." Although it has been demonstrated that episiotomy prevents anterior lacerations, none of the other claimed benefits have been supported (Woolley, 1995). In fact, episiotomies were found to increase maternal blood loss, anal sphincter damage, and the depth of posterior perineal lacerations, all of far more serious consequence than the claimed benefits (Woolley, 1995). Adding this to the pain associated with the cutting, suturing, and subsequent healing leads many to suggest that episiotomies should not be done routinely in hospital deliveries (Reynolds, 1993). This is not to suggest that uncontrolled tearing of the perineum should be tolerated. Women in the past and in many other cultures today probably spent significant portions of their lives in the squatting position and thus had stronger perineal tissue than most women do today. Thus, the risk of tearing is probably higher today. Nevertheless, many midwives believe that tearing can be reduced with perineal massage, lubrication, and exercise (Labrecque et al., 1994). Use of a delivery position other than lithotomy significantly reduces the need for episiotomy (Lydon-Rochelle et al. 1995).

A final aspect of modern obstetrics that was certainly lacking in the past is the ability to deliver an infant by cesarean section. Much has been written

about the increase in the rate of surgical deliveries in the United States and in other industrialized countries (Francome and Savage, 1993; Nielsen, 1986; Nielsen et al., 1994; Taffel et al., 1992). In the United States, the proportion of babies delivered by cesarean section in 1993 was 21.8% (Guyer et al., 1995).[5] I will not add to this literature except to say that the increased morbidity related to surgical delivery is often unappreciated because it persists for months or even years after a woman has left the hospital, or it may be viewed as minor in the eyes of medical accounting. Nielsen (1986) lists several postoperative complications, primarily infections such as endometritis, urinary tract infection, wound infection, peritonitis, and pelvic abscess (risks ranged from 13% to 65%). More subtle problems have also been reported. For example, a study of 588 women who delivered by cesarean section in a Glasgow teaching hospital in 1986 revealed that three months after delivery, 35% believed that they had not yet fully recovered and 28% felt less healthy than they had before pregnancy (Hillan, 1992). Many reported backaches (55%), constipation (49%), and depression (38%). Although these may not seem like life-threatening situations, they still have an effect on the lives and experiences of individual women, their infants, and their families.

Obviously, there is no reasonable alternative to justified and necessary surgical delivery. Death for both mother and infant were the most likely results of a number of risky situations in our ancestral past, including cephalopelvic disproportion (head too large to pass through the maternal pelvis), placenta previa (the placenta covering the cervical opening), and prolapsed umbilical cord (when the cord precedes the infant in delivery). In these cases, the twenty-first century high tech alternative is welcomed. Considering the risks associated with this major surgery, however, there are a number of situations in which the ancient practices of waiting, walking, and offering emotional support may prove more beneficial.

Emotional Support in Labor and Delivery

Among the by-products of advances in the technology of childbirth has been an increase in the distance between caregivers and birthing women, an increase in the number of specialists attending women, and a decrease in the amount of time each attendant is able to devote to each woman. In other words, a major result has been a change in the social environment of birth. Several of these changes have met with resistance on the part of women giving birth in hospitals. Michaelson (1988) cites a 1957 article in the *Ladies Home Journal* decrying the dehumanizing nature of hospital birth, which was followed by hundreds of letters from women expressing their negative reactions to the lack of concern on the part of those who attended them in childbirth. The women who wrote the letters were generally positive about the decrease in mortality and morbidity,[6] but were dissatisfied that "the safe efficiencies had become a kind of industrial production" (Wertz and Wertz, 1977:173). Many expressed dissatisfaction with how impersonal this most significant event in their lives was regarded by the people who attended them.

In the first half of this century, it is possible that there was more social interaction and personalized care than we see today, because, for example, fetal heart tones were monitored with a manual fetoscope, requiring nurses to make tactile contact with a laboring woman several times an hour. Moreover, nurses or physicians visually assessed labor progress and cervical dilation stage, often by simply talking with the laboring woman and observing her behavior (see e.g., recommendations of Myles, 1975).[7] Their frequent presence likely provided more information to the laboring woman, potentially alleviating some of her concerns and anxieties. In contrast, a recent study reported a near absence of physical comfort measures provided by nurses during labor and delivery (Hodnett and Osborn, 1989). The authors of this study note that their results confirm anecdotal accounts of "changes in the intrapartum nursing role from one emphasizing hands-on comfort to one relying on technology, including pharmacologic methods of pain relief" (Hodnett and Osborn, 1989: 182).

Devices such as electronic fetal heart monitors often substitute for the jobs previously performed by nurses. But use of these devices may fail to provide the personal human touch, including answering questions of laboring women. McNiven and her colleagues (1992) note that the evolution of obstetric care in the United States is almost synonymous with the evolution of technology and physician-directed interventions (McNiven et al. 1992). They report that the primary relationships during labor and delivery seem to be those between individuals and electronic devices and the technicians that work with the machines.

In an Australian study of 790 women, Brown and Lumley (1994) found that women who reported dissatisfaction with the information they were given by physicians, midwives, and nurses during labor and delivery were four to six times more likely to report overall dissatisfaction with the quality of care they received. Women who rated caregivers negatively on kindness and understanding were four to five times more likely to rate overall care negatively. There is also evidence that caregivers are not aware that they are not being supportive of women during labor and delivery. McKay and Smith (1993) found, for example, that caregivers' perceptions of quality of support and communication was higher than the perceptions of the recipients of their support. Even when the caregivers viewed videotapes of their activities during labor and delivery, they felt that they had given adequate care and support. Clearly what is defined as helpful by one group (caregivers) is not perceived as such by the other (laboring women). Considering all of the demands on nurses and physicians during labor and delivery (e.g., working with and interpreting the electronic devices noted above), it is understandable that they feel that they have given maximum support to the women in their care. Furthermore, physicians and nurses are usually responsible for several patients at one time and cannot provide the continuous support often desired by laboring women.

Dissatisfaction with medical care occasionally leads to legal action, which has the effect of increasing the use of technology during birth because insurers request or require it (Shearer and Eakins, 1988). Shearer and Eakins (1988:32) point out that one reason for an increase in malpractice suits is that physicians do not spend enough time with patients: "Why are midwives and family practitioners not sued at the same rate as obstetricians? The answer is that people do not sue their friends, their trusted resources. . . . Midwives respect the sanctity of birth, and they spend the time to become trusted friends and resources for parents."

Dissatisfaction of women about their childbirth experiences has spawned numerous books[8] and has resulted in a number of changes in the ways in which hospitals and physicians treat this event. Changes include allowing husbands and other family members to be with women during labor and delivery, offering alternatives to delivering in a supine position on a delivery table, honoring numerous individual requests from laboring women and their partners, encouraging women to use fewer drugs during labor and delivery, and providing more homelike atmospheres for normal deliveries. But still, for many women, there remains the unmet need of emotional support during labor and delivery.

What Can the Evolutionary Perspective Tell Us?

Why might women need emotional support during labor and delivery? After all, for almost all mammals, birth is a solitary affair (see Trevathan, 1987, for a review of birth in several mammalian species). The most typical mammalian response to the increasing intensity of contractions is for the laboring female to seek an isolated spot in which to deliver her infant, brood, or litter. Even among social species, such as monkeys and apes, the female typically moves to the periphery of the group to deliver (see, e.g., Altmann, 1980; Goodall and Athumani, 1980). These reported responses suggest that the contractions of labor are a signal to seek solitude. In contrast, the typical human response to increasing intensity of contractions is to seek companionship. Why would there be a difference in the meaning of labor contractions? Another way of putting it is to ask: At what point in our evolutionary history did the signal content of active labor change from "seek isolation" to "seek companionship"?

A reasonable proposition, given the evolutionary history of the human species, is that natural selection favoring bipedal locomotion among human beings ultimately led to changes in the way females interpreted and responded to intense labor contractions (Trevathan, 1987). This does not mean to suggest that difficult and painful birth are unique to bipedal humans, however; birth is a physical challenge for most primates (see Schultz, 1949). An important characteristic of the primate order is a large ratio of brain or head size to body size. This means that the passage of the fetal head through the maternal pelvis

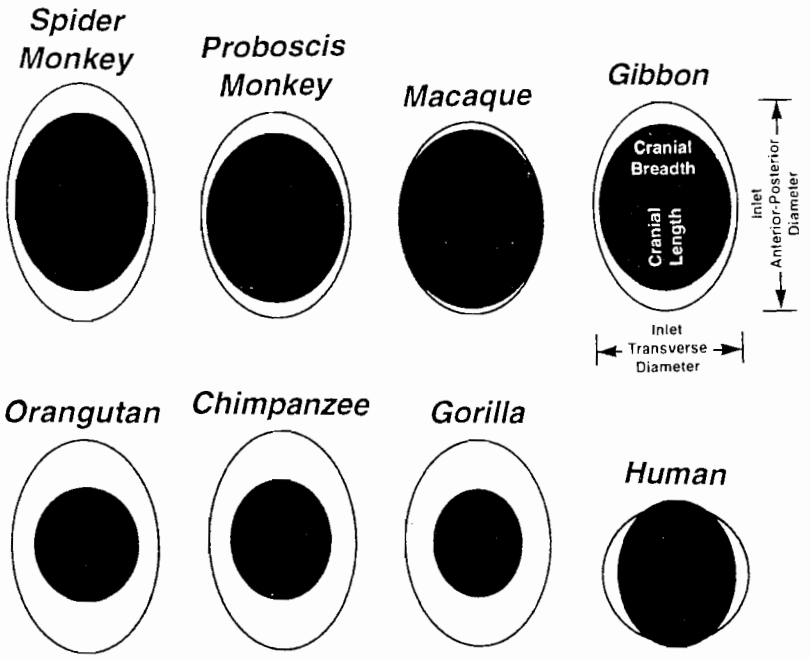

Figure 8.1. Relationship of maternal pelvis (dark outlines) and fetal head (solid dark ovals) (after Schultz, 1949).

is generally a tight squeeze (figure 8.1). Because of this, mortality from cephalopelvic disproportion is not insignificant in primate species such as marmosets, squirrel monkeys, baboons, and macaques (Leutenegger 1981). The modern great apes appear to be exceptions to this phenomenon, because the pelvic canal is not so narrow in comparison with the neonatal head (Leutenegger 1972), but it is likely that the last common ancestor of humans and great apes had a pelvis/neonatal head ratio similar to that of modern monkeys and gibbons (Ward, 1994). (Selection for increased body size in great apes occurred after the divergence of the ape and human lines.) But modern primates still accomplish birth without assistance, so it is probable that our prehominid ancestors did so as well.

Approximately 5 million years ago, selection began to favor the anatomical and behavioral changes that led to bipedal walking in hominids (Conroy, 1990; Lovejoy, 1988). Whatever the "cause" or benefits of this new mode of locomotion, it resulted in fundamental changes in the way birth occurred. In quadrupedal species like monkeys (and in the probable quadrupedal ancestor of humans), the entrance and exit of the birth canals have their greatest breadth in the front-to-back (sagittal) dimension (figure 8.2). The infant, whose head is also largest in the sagittal dimension, passes straight through the birth canal

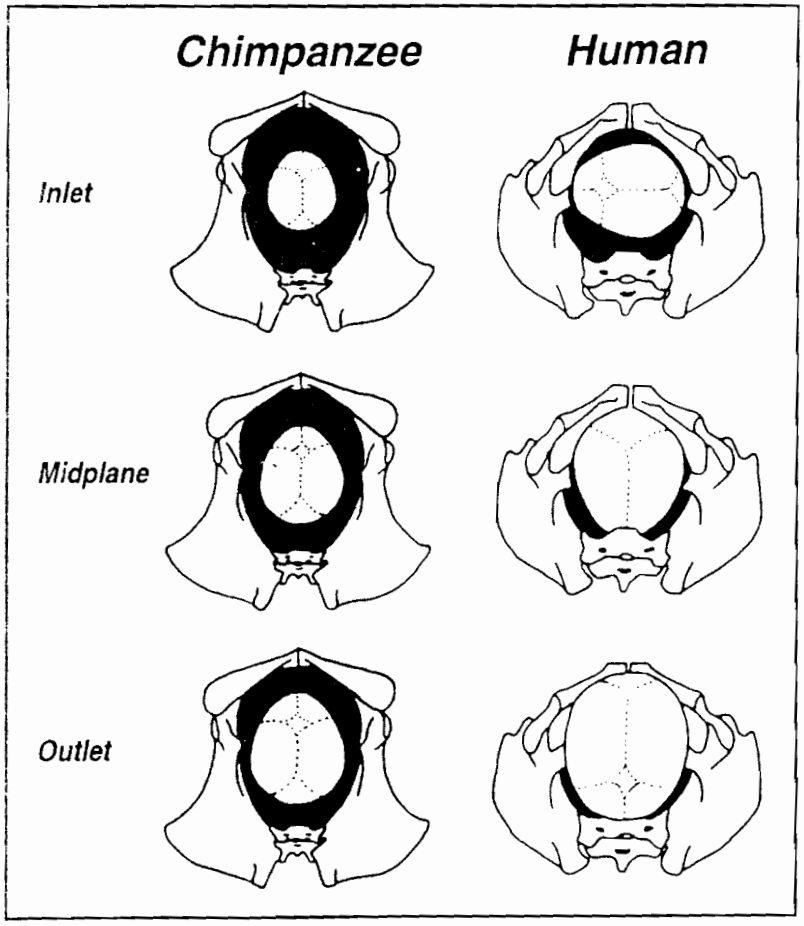

Figure 8.2. Pelvic inlet, midplane, and outlet of chimpanzee and human.

with the head extended (figure 8.3) (Stoller, 1995a,b). Stoller (1995a,b) has presented evidence that when the monkey fetal head is extended (with the back of the head against the top of the vertebral column), the mandible first contacts the bottom of the pelvis and rotates under the pubic arch, thus emerging in a position referred to in obstetric texts as "occiput posterior." This term refers to the fact that the base of the fetal skull (the occiput) is against the back (posterior) of the mother's pelvis. (Stoller points out that the emergence of the infant monkey is more appropriately referred to as a "face presentation" because the occiput posterior position of human obstetric texts assumes a flexed fetal head, one in which the chin is pressed against the throat.) This means

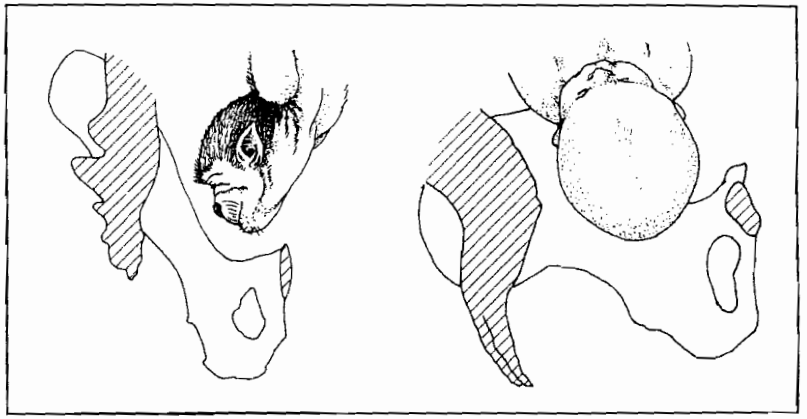

Figure 8.3. Lateral view of fetal descent in baboon (with head extended) and human (with head flexed).

that the baby monkey emerges facing toward the front of the mother's body and that she can reach down with her hands and guide it from the birth canal, or it can crawl up toward her nipples, unassisted (for a review, see Rosenberg and Trevathan, 1996; Trevathan, 1987).

One result of the evolution of bipedalism is that the birth canal is twisted in the middle so that the inlet is broadest in the transverse dimension, the outlet in the sagittal dimension. Thus, the maximal breadths of the entrance and exit are perpendicular to each other. The relevant fetal dimensions are also perpendicular: the head is largest in the sagittal dimension, the broad, rigid shoulders in the transverse dimension. According to Stoller (1995b), the passage of these broad, rigid shoulders through the deep bony pelvis requires that the neck be flexed. (Monkey shoulders are not as broad as those of apes and humans [Schultz, 1949], so they do not have this same effect on the birth process, and the head remains extended.) This flexion, coupled with the restructured bony birth canal, means that the human infant must undergo a series of rotations to pass through the birth canal without hindrance (figure 8.4). When the head is flexed during delivery, the occiput contacts the bottom of the pelvis first and rotates under the pubic arch (Stoller, 1995b). Therefore, in most cases, the human infant emerges with the occiput against the mother's pubis ("occiput anterior" in obstetric texts) and thus faces away from the mother when it is born. (Once the head has delivered, the infant's body rotates to enable the shoulders to pass through the pelvic outlet, so the baby turns to face to the side at this point.)

This tendency for the human infant to be born facing away from the mother is the change that I argue had the greatest impact in transforming birth from a solitary to a social event (figure 8.4E). This position hinders a mother's ability

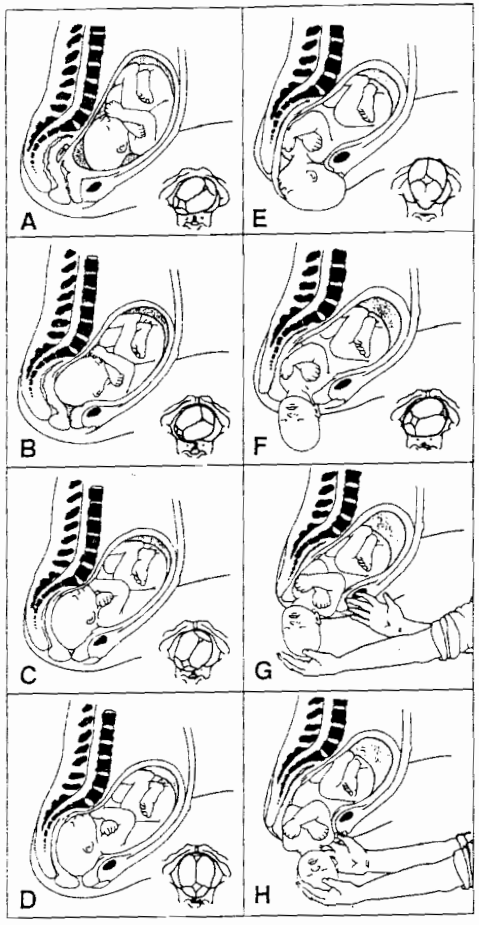

Figure 8.4. Series of rotations through which the human infant must pass during the birth process.

to reach down and clear a breathing passageway for the infant and to remove the cord from around the neck if it interferes with breathing or continued emergence. In most deliveries, if she attempts to guide the infant from the birth canal, she risks pulling it against the body's angle of flexion, perhaps damaging nerves and muscles in the process (Trevathan, 1988). It is reasonable to argue that simply having another person in the vicinity who could assist in this final stage of delivery would have reduced mortality. (Today, unattended births are usually associated with higher mortality than attended births [Edwards, 1973; Ohio State Medical Society, 1975]). Thus, it can be argued that with the origin of bipedalism, risks of mortality from unattended birth became greater than the risks associated with having others in the vicinity of the birthing female. I suggest that early hominid females who sought assistance or companionship at the time of delivery had more surviving and healthier offspring than those who continued the ancient mammalian pattern of delivering alone. Thus, the evolutionary process itself first transformed birth from an individual to a social enterprise, with the accompanying underlying emotions that motivated the behavior in the first place.

With increased brain size in the genus *Homo* (beginning about 2 million years ago), the already tight fit between infant head and maternal pelvis became even tighter, although one of the compromises to the conflict between selection for large brains and narrow birth canals was to delay most brain growth to the postnatal period. The result of this adaptation is that human infants today are less developed and more altricial at birth than most primate infants (see table 8.2). Giving birth to more helpless altricial infants, unable to assist themselves during delivery, posed more challenges to ancestral hominid females, adding to the advantages of having another person present at delivery.

It is not likely that early hominids consciously sought assistance at birth to reduce mortality, but merely that they felt a range of emotions that caused this positive result. The more immediate need (proximate cause) was probably to reduce fear, pain, and other emotional stress. Another consequence of increased brain size may have been an increased awareness or consciousness about the dangers of birth. Associated with this consciousness are the emotional signals, whatever their meaning, which led to seeking companionship during the later stages of labor and delivery (see also Hays, 1996).

Certainly there is much variation in the ways women interpret labor contractions, depending on cultural context and individual experiences. Intense labor contractions may lead to fear, doubt, confusion, joy, excitement, or un-

Table 8.2 Neonatal brain weight as a percentage of adult brain weight for selected primate species (data from Harvey and Clutton-Brock, 1985)

Species	% of adult weight
Galago *(Galago senegalensis)*	48
Howler monkey *(Alouatta palliata)*	56
Spider monkey *(Ateles geoffroyi)*	58
Rhesus macaque *(Macaca mulatta)*	57
Yellow baboon *(Papio cyocephalus)*	43
White-handed gibbon *(Hylobates lar)*	47
Orangutan *(Pongo pygmaeus)*	41
Common chimpanzee *(Pan troglodytes)*	31
Gorilla *(Gorilla gorilla)*	45
Human *(Homo sapiens)*	31

certainty. But, except in rare and unusual circumstances, the behavior resulting from the signal is usually seeking another person. Underlying these emotions, and perhaps contributing to their expression, are painful contractions, extreme exertion, hormones such as prolactin and oxytocin (see Insel, 1992, for a review of the effects of oxytocin on maternal behavior), and the presence of the newborn infant.

Contemporary Studies of the Effects of Social and Emotional Support in Childbirth

Recent studies consistently demonstrate the positive effects of social and emotional support during labor and delivery (Hofmeyr et al., 1991; Kennell et al., 1991; Klaus et al., 1992; Sosa et al., 1980; Wolman et al., 1993). In one study (Hodnett and Osborn, 1989), the categories of support recalled by mothers as being most meaningful to them during labor were (1) physical comfort (stroking, massaging, assisting with movement, offering fluids), (2) emotional support (reassuring, quietly talking, giving encouragement, being continuously present), (3) information (coaching with breathing, giving advice, interpreting assessments of medical staff, explaining procedures), and (4) advocacy (interpreting the laboring woman's needs to medical staff, supporting her decisions). All of these contributed to the women reporting more positive feelings about their experiences and the people who cared for them.

Not only does social support contribute to more positive feelings about the birth experiences, but there is evidence that biomedical outcome measures are improved as well. For example, Klaus and his colleagues (1992) summarized randomized trials conducted in hospitals in four different countries. They evaluated the effectiveness of emotional support provided by women whose job was solely to provide support consisting of praising and reassuring the laboring women, providing physical contact such as rubbing and holding, explaining procedures, and being continuously present. Women delivering in selected hospitals were randomly assigned either to receive social support or to receive the routine procedures offered by the hospital. A summary and analysis of five independent studies revealed that the effect of social support included a reduction in the caesarean section rate by as much as two-thirds, reduction in the length of labor by approximately 25%, and reduction in the use of forceps by as much as 82%. Six weeks after the birth, the effects were still apparent, represented by increased breast-feeding,[9] more time spent with the infant, less anxiety, lower scores on a depression scale, higher self-esteem, and more positive feelings about partners and infants.

Thornton and Litford (1994) reviewed the British practice known as "active management of labor," which includes early amniotomy, use of oxytocin to accelerate labor, and continuous support by a labor companion; the use of this protocol has been demonstrated to reduce the incidence of cesarean section. The reviewers conclude, however, that "the effective ingredient seems to be the presence of a companion in labour rather than the performance of amniotomy or administration of oxytocin" (Thornton and Litford, 1994:368).

A South African study of the effects of companionship during birth on postpartum depression found that those who received extra companionship had higher self-esteem scores ($p<.001$) and lower postpartum depression and anxiety ratings ($p<.001$) 6 weeks after delivery compared with those who experienced the routine hospital care without extra social support (Wolman et al., 1993). This research is consistent with previous evidence that social support during pregnancy, delivery, and postpartum is the single most important factor in preventing postpartum depression and such negative sequelae as physical and emotional health disorders and problems in the early mother–infant relationship that can be long-lasting. In the study cited above, women in the support group were more likely to be breast-feeding their infants exclusively (Hofmeyr et al., 1991) If we accept that successful breast-feeding is desirable (see, e.g., Stuart-Macadam and Dettwyler, 1995), then this suggests that social support in labor and delivery may not only have positive effects on the woman herself, but also on the long-term health of her infant.

In their study of Guatemalan women, Sosa et al. (1980) found that women who had received social support during labor and delivery were awake longer after delivery ($p<.02$) and stroked ($p<.09$), smiled at ($p<.01$), and talked to ($p<.01$) their babies more than those who received the routine hospital care regimen. These authors suggest that providing social support has implications for the ease with which mothers and infants attach and thus for long-term family health and relationships (see Klaus and Kennell, 1982, for a review). In a Houston study of deliveries, the cesarean-section rate for those who received extra emotional support during labor and delivery ($n = 212$) was reduced by 10% and the epidural rate by 75% (Kennell et al., 1991). Extrapolating from these figures, it is estimated that maternity costs in the United States could be reduced by $2 billion if every woman had a support person with her in labor (Klaus et al., 1992). It seems that these welcomed changes would come at very little additional costs per delivery and at great reductions in obstetric costs per capita.

It is quite common for studies like those reviewed above to cite the extensive cross-cultural evidence that emotional support from another woman is an almost-universal component of maternity care today and one that has a long history. Kennell and his colleagues, for example, note that the practice of providing support during labor is "centuries old" (Kennell et al., 1991). An evolutionary perspective, however, informs us that this type of support is not, in any sense, a recent historical phenomenon. As argued above, an evolutionary perspective argues that dependence on assistance at birth is a characteristic of human behavior that results from bipedal upright walking, which evolved approximately 5 million years ago. Its very antiquity leads to the suggestion that social and emotional support in labor may be as crucial for optimal health of mother and infant as physical and medical assistance.

Who can provide this crucial support? Cross culturally and historically,

normal pregnancy, birth, and the postpartum period take place surrounded by supportive friends and family in familiar environments (see, e.g., Jordan, 1993; Kay, 1982; MacCormack, 1982; Trevathan, 1987). But for many women giving birth today, their closest support persons may be their husbands. Are husbands likely to provide the needed support for women in labor and delivery? In most of the studies reviewed above that reported positive effects of companionship during labor and delivery, the support person was *not* the husband. Although his presence may be important to the woman, it is not likely that he can provide the informational and emotional support described above because of his own emotional investment in his wife and the birth of their child. In fact, his needs at this time may often equal those of his wife, and he may not be able to give the support she needs. Several studies of the effects of husband's presence on a woman's experience with labor and delivery report that, under certain circumstances, the husband's presence actually exacerbates the stresses of labor and delivery (see, e.g., Katz, 1993; Kennell et al., 1991; Nolan, 1995). Keinan et al. (1992), for example, found that for multiparas who scored low on anxiety rating, the presence of the husband resulted in higher tension than did his absence. They also note, however, that 85% of the women in their study reported that they wanted their husbands to be present for reasons other than stress reduction. This suggests that husbands play a different role from that of the birth assistants (see also Bertsch et al., 1990).

Solutions

If, indeed, there is a mismatch between the evolved needs of women during labor and delivery and the contemporary medical system designed to meet those needs, this potential mismatch can be easily remedied. The addition of a labor companion to the obstetric teams in hospital deliveries could likely lead to a decrease in complications of labor and delivery, decrease in postpartum depression, increase in patient satisfaction, increase in breast-feeding, decrease in obstetric costs, and decrease in malpractice suits.

Most labor companions who provide social and informational support are not ordinarily professionally trained as midwives, nurses, or psychologists. In the studies cited above, most of the supporting women had previously given birth and, upon interview, showed evidence of being able to be empathetic toward laboring women (see, e.g., Hofmeyr et al., 1991). The labor companions were also not usually part of the hospital staff, and most were drawn from the same community as the laboring women, although they were usually unknown to the women.

How important is it that the labor support people be trained? Should they be paid for their services? In some of the studies reviewed by Chalmers and Wolman (1993), the women acting as labor companions volunteered their services; in other cases, they were paid as much as $200 per delivery (Kennell et al., 1991). In the latter study (Kennell et al., 1991), the labor companions also received 3 weeks of specialized training in the process of normal labor, obstetric procedures, hospital policies, and supportive techniques, although there is evidence that labor support can be provided by untrained women. Indeed, in a survey of 19 studies of the effect of social support in labor, Chalmers and Wolman (1993:6) conclude that "Of all the different types of labor support which have been studied, the most impressive, consistent, and methodologically sound results have been obtained for support given by lay, untrained female supporters."

A professional service class of birth counselors and companions would be a contemporary response to the deep-rooted social needs of twenty-first century women. This profession could absorb the functions of childbirth educators, monitrices, lactation counselors, and *doulas* (see Raphael, 1973), all of which have recently appeared in many Western societies to replace family-centered support groups of times past. Compatible with the Western emphasis on training and education, professional birth counselors could receive training in reproductive biology, reproductive psychology, midwifery, lactation, child development, and grief counseling. Most of these topics could be covered in a semester-long course in community colleges similar to "nanny" classes currently offered.

Childbirth education should be part of the routine services provided by the birth counselor and, following delivery, lactation and other postpartum support could continue to be provided. In the event of a stillbirth, neonatal death, or malformation, the birth counselor could also be the person to provide initial grief counseling and other similar support that the mother and father needed. Although the baby would be taken for pediatric exam early in life, most of the routine child-care advice could be provided by the birth counselor. This opportunity for continuity in care would probably help to fill the void and uncertainty that many contemporary women feel when they are pregnant and experiencing first-time motherhood.

Conclusion

Oakley (1983) has used the concepts of "hard" and "soft" outcomes to describe the results of labor and delivery. The usual measures of morbidity and mortality assessments are the hard outcomes; "psychosocial morbidity" refers to the soft outcomes. Both may be equally important in evaluating the success of parturition, and they are complementary. If we accept the studies demonstrating the positive effects of having someone present at delivery to provide emotional support, it seems that we can have the best of both worlds: the welcomed reduction in mortality provided by many modern obstetric procedures and the increased positive feelings provided by the ancient practice of having emotional support from another woman.

We have behind us a heritage of 5 million years of hominid evolution, during which time having someone present to help during the final stages of

delivery, especially with challenges to neonatal respiration, probably made the difference between life and death for many hominid mothers and infants. With encephalization and the origins of consciousness, awareness of vulnerability heightened the emotional impact of birth, which probably led the normally gregarious human female to seek companionship at this time. In other words, women experience heightened emotions at birth which lead them to seek companionship, which, in turn, leads to the ultimate outcome of lowered mortality and greater reproductive success for the women who behave in this manner. These emotions of childbirth are among the human adaptations to the obstetrical complications of bipedalism, and their roots are ancient.

At its best, evolutionary medicine links knowledge of human evolutionary history and cross-cultural studies with recent developments in biomedical and clinical research. Those of us who adopt this perspective argue that only by understanding the human condition in both its evolutionary and historical/cultural context can we help to bring about changes in contemporary medical practice that positively affect not only morbidity and mortality, but also human social and emotional fulfillment.

Notes

1. For a more thorough review of contemporary birth technology, see Brackbill et al. (1984) and Davis-Floyd (1992).

2. For example, Oxorn and Foote (1975) cite the following as the bounds of normal labor: First stage, 6–18 hours in primiparas (first-time mothers) and 2–10 hours in multiparas; second stage, 30 minutes to 3 hours in primiparas, 5–30 minutes in multiparas.

3. The Monthly Vital Statistic Report #44 (1996: 15–16) reports that EFM was used in 80% of all live births in 1994.

4. Oakley (1984:33) quotes Duncan (1870, p. 110): "The mortality of maternity hospitals is said to be so great that it is expedient, indeed absolutely necessary, to close them entirely."

5. Cesarean section rates were first available from national birth certificates in 1989. That year, 22.8% of births were delivered by cesarean section, so there has actually been a slight decline in rates since 1989.

6. Indeed, between 1950 (when standards for safe medical practices in obstetrics were established by the American College of Obstetrics and Gynecologists) and 1975, there was an 8- to 10-fold reduction in maternal mortality and an approximate 50% reduction in infant mortality in the United States (Aubry, 1977). One important element in the standards was that birth should take place in hospitals.

7. Here is an example of advice given to midwives in Myles's (1975: 228) classic text, under the heading "Emotional Support During Labour":

> Loneliness breeds fear. The comforting companionship of the midwife who will listen, explain, encourage and assure, or keep silent as required, is of inestimable value to the woman at this time. When labour is established the midwife should remain in constant attendance.
>
> It is essential for the peace of mind of most women that they be kept informed regarding the progress they are making. Women respond magnificently to a word of praise, and being given reasons or explanation.

8. Examples of books calling for changes in the way in which childbirth is treated in the United States include Gilgoff (1978), Romalis (1981), Oakley (1984), Inch (1984), Brackbill et al. (1984), Sagov et al. (1984), Davis-Floyd (1992), and Mitford (1992).

9. For example, in one study 51% of those with social support at delivery were breast-feeding at 6 weeks compared with only 29% of those who did not receive the extra support (Hofmeyr et al., 1991).

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