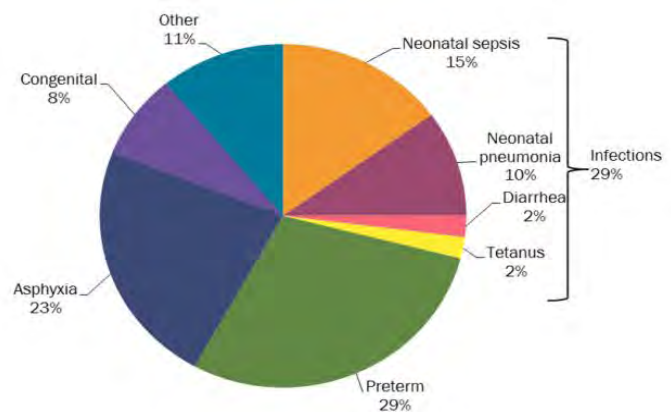


# Better Intrapartum Practices to Reduce Newborn Infection

## The Problem of Newborn Infection

Thirty-six percent of under-five deaths occur in the neonatal period, i.e., the first four weeks of life, accounting for more than three and a half million deaths annually.<sup>1</sup> Of these, almost one million deaths occur from infection during the first week of life, and a large percentage of these are preventable. Infections are the main cause of neonatal death, accounting for nearly 30% of the total (see figure at right). This brief examines how to reduce newborn infections through better intrapartum practices.

Sepsis is a severe infection that spreads throughout the body. It is a major cause of maternal mortality, accounting for approximately 15% of maternal mortality globally.<sup>2</sup> Moreover, since the health of the mother and health of the baby are inextricably linked, maternal sepsis is linked to newborn sepsis in a potentially fatal connection. The practices of clinicians caring for women during labor and birth may either contribute to or help prevent infections in both the mother and the baby.



Source: Lawn JE, Kerber K, Enweronu-Laryea C and Cousens S. 2010.

Newborn sepsis is usually categorized as:

- Early onset sepsis (EONS), which presents within the first 72 hours of life and is usually acquired from the maternal genital tract and during the course of labor
- Late onset sepsis (LONS), which presents after the first 72 hours of life, is usually caused by organisms present in the hospital, home or community and is acquired during or after the delivery

Because newborn babies have an immature immune system and lack the normal microbial flora of non-pathogenic organisms, their systems can easily become colonized with organisms encountered in the maternal genital tract and in their environment. The specific organisms causing hospital-acquired newborn infection vary by geographic region and even by the facility where they were acquired. Common organisms present to varying degrees in many parts of the world include Klebsiella, E. coli, Staphylococcus aureus, and Group B Streptococcus (GBS).<sup>3,4</sup> Less is known about the organisms responsible for newborn sepsis at home births. For all childbirth settings, the same intrapartum practices can reduce the risk of early newborn sepsis.

### **Intrapartum practices that *reduce* infection**

- Hand hygiene, HLD gloves
- The “Six Cleans”
- Minimization of vaginal examinations
- Use of partograph
- Prompt diagnosis and treatment of prolonged labor
- Prevention, prompt diagnosis and treatment of chorioamnionitis

### **Intrapartum practices that must be *avoided***

- Routine vaginal examinations at shift change
- Multiple vaginal examinations
- Vaginal examinations after rupture of membranes
- Shaving of the genital area
- Enemas

## **Intrapartum Conditions and Practices That *Increase* the Likelihood of Newborn Sepsis**

The burden of EONS is highest in the poorest parts of the world and in the poorest communities in low- and middle-income countries. Most births and deaths occur at home, and are often not recorded, resulting in a severe lack of data about incidence of neonatal sepsis in the developing world. Because most EONS is associated with maternal infection and/or unhygienic birth practices and is usually acquired during the course of labor, this brief examines a number of labor- and birth-related conditions and practices that can increase the likelihood of early newborn sepsis. However, because LONS is associated with pathogens acquired in the home or hospital setting, these infections may also be linked with birth practices.<sup>5</sup>

Infections in the newborn are closely linked to infections in the mother. Chorioamnionitis is a maternal infection, usually bacterial, of the fetal membranes and/or amniotic fluid, and strongly associated with prolonged rupture of membranes and long labors. If untreated, chorioamnionitis can result in severe infection of the mother’s uterus as well as of the newborn, and can be fatal in either case. Specific events during labor can predispose to chorioamnionitis. These include: 1) premature rupture of the membranes (PROM)—either spontaneous or artificial—more than 18 hours before the birth; 2) prolonged labor of more than 24 hours; 3) more than three vaginal exams during labor; and/or 4) any unclean vaginal exam during labor.<sup>6,7</sup> Cesarean deliveries or assisted vaginal births with forceps or vacuum extractor also increase the risk of maternal infection. Practices that cause breaks in the skin, such as routine genital shaving, should also be avoided. Routine enemas cause discomfort to the woman, do not prevent maternal or neonatal infection, and do not shorten labor.<sup>8</sup> Women who have compromised health from any condition (e.g., severe anemia, malaria, HIV) are at greater risk.

The fetal membranes form a protective sac around the newborn so that the amniotic cavity nearly always is sterile, but when these membranes are ruptured, a portal for infection of the fetus is formed. The commonly seen practice of frequent vaginal exams by each of the staff caring for women during labor increases the risk of infection for mother and baby even if the membranes are not ruptured. Situations that are likely to lead to multiple examinations include routine examinations at change of shift and failure to use the partograph.

It has been known for more than 150 years that handwashing prevents perinatal infection. Providers who fail to wash their hands before every exam as well as providers who do not use high-level disinfected (HLD) gloves all introduce contamination through the vaginal canal and into the uterus. Unhygienic environments such as unclean linens and contaminated surfaces such as beds and tables also increase the risk of infection. Operative and assisted births also provide the means for introduction of organisms that reside on unsterile instruments, equipment and gloves. High rates of newborn infections in hospitals may lead to negative

impressions by women and communities, further reducing the number of women choosing facility births.<sup>9</sup> Whether births are in homes or in facilities, infection of the newborn is a serious but often preventable problem.<sup>10</sup> All staff, including cleaners, must be involved in infection prevention efforts.

Prevention of maternal infection is also important because chorioamnionitis is associated with preterm labor and birth. Although this brief deals with full-term infants, sepsis is even more life-threatening for preterm and low birth weight infants. Low birth weight infants and preterm babies born before 37 weeks' gestation have an incidence of infection three- to 10-fold higher than full-term, normal weight babies.<sup>11</sup> Therefore, special care must be taken to protect the preterm or low birth weight infant from exposure to pathogens during labor, birth and the postpartum.

## Intrapartum Practices That Reduce the Risk of Newborn Sepsis

Although some causes of maternal and neonatal infection can be prevented or treated during the antenatal period, many practices during labor and birth can reduce the risk of early onset infection in the newborn.

### Hygiene

Standard infection prevention practices (e.g., hand hygiene, cleaning/disinfection of delivery surfaces and equipment/supplies, and HLD or sterilization of reused equipment/supplies), are the primary means of infection prevention. Proper disposal of contaminated waste should be included as part of standard infection prevention practices.

The most common way that infections are transmitted in health care facilities is on health care workers' hands. Health care-associated infections are common causes of illness and even death in rich and poor countries alike.<sup>12</sup> Handwashing or use of an alcohol-based, antiseptic hand rub before and after contact with each woman or newborn and after contact with blood or bodily fluids is critically important for sound infection prevention. Therefore, a source of clean running water, as well as soap and clean towels, must be accessible to the labor and delivery area. When handwashing facilities are not accessible in these areas, an alcohol-based hand rub should also be available and conveniently located in all patient contact areas. Handwashing is an essential infection prevention measure whether in a facility or in the community. In rural Nepal, birth attendant handwashing was related to a statistically significant lower mortality rate among neonates (adjusted relative risk [RR] = 0.81; 95% confidence interval [CI], 0.66–0.99).<sup>13</sup> Also in Nepal, a study on handwashing at home births found the adjusted risk of newborn cord infection was 27% (95% CI: 17–36) lower among infants where the birth assistant washed her hands with soap before delivery.<sup>14</sup>

A 2009 review found evidence that nosocomial infections can be reduced by 40% with adequate hand hygiene.<sup>15</sup> Clean birth kits that have been shown to reduce neonatal sepsis include a clean, unused razor blade, a clean surface for the delivery, clean cord ties and a bar of soap.<sup>16</sup> Although clean birth kits were developed for non-facility births, all settings for childbirth require excellent hygiene, and clean birth kits brought to the facility by the mother may be a way to reduce neonatal sepsis.



Likewise, HLD gloves must be consistently used for each vaginal exam. Feces or other contaminants should be cleaned from the perineum prior to the vaginal exam or birth. All instruments that are used with mother or baby must be HLD or sterile. In addition, the surface of the birthing or exam table must be thoroughly cleaned with a disinfectant solution to prevent the spread of organisms between clients.

### **A Memory Aid for Birth Attendants Lists “The Six Cleans”:**

- Clean hands – vigilant handwashing and HLD gloves are essential for vaginal exams or when handling the baby
- Clean perineum – feces should be wiped away and the perineum washed prior to the birth (mother can shower or bathe)
- Nothing unclean introduced into vagina – not hands, herbs or other substances
- Clean delivery surface – a plastic cover is appropriate for home births; at facilities, the delivery surface should be cleaned and then wiped with a 0.05% solution of chlorine after each use
- Clean cord cutting instrument – at home, a razor blade or scissors should be boiled for 20 minutes before use
- Clean cord care – the cord should be tied with a clean tie or clamp, nothing should be put on the cord, and it should be kept clean and dry at all times

In addition, the towels or cloths used for drying and wrapping the baby must be washed and clean. Vigilant adherence to these hygiene measures will help reduce the risk of maternal and newborn infection. The use of clean delivery kits and the “Six Cleans” in non-facility births is associated with a reduction in both maternal and newborn infection.<sup>16,17</sup>

### **Vaginal Exams**

In addition to observing hygiene measures for vaginal exams, the care provider should limit the number of vaginal exams to those that are necessary rather than routinely conducting exams as frequently as every hour or two or when staff change shift. As previously noted, multiple vaginal exams in labor increase the risk of chorioamnionitis. Likewise, a digital exam should not be conducted on a woman whose membranes have ruptured if she is not in labor. Only a sterile speculum exam should be conducted on such a client, and that should be limited to a single evaluation of rupture of membranes. Furthermore, the care provider should avoid pushing the tip of the examining finger through the cervix until active labor or the decision to induce occurs, even when membranes are intact.

### **Partograph**

The partograph is a graphic tool that tracks the progress of labor as well as the condition of the mother and fetus to facilitate safe and effective decision-making concerning management of labor. The use of the partograph to monitor and guide decision-making in labor has been shown to reduce cesarean deliveries, improve early interventions for prolonged labor and improve neonatal outcomes in low-resource settings.<sup>18</sup> One of the greatest contributors to perinatal infection is prolonged labor, and use of the partograph with its timelines for alert and action makes prompt diagnosis more likely. Partograph guidelines limit vaginal exams to one every four hours, thus reducing opportunities to introduce organisms into the vagina or cervix. The partograph also reduces sepsis in the newborn by reducing prolonged labor, assisted vaginal delivery and emergency cesarean sections—three factors that increase the risk of sepsis.

### **Antibiotics**

Prophylactic antibiotics are necessary to prevent chorioamnionitis, puerperal sepsis and newborn sepsis when rupture of membranes occurs 18 hours or more before the birth. Risk of infection increases as the duration of ruptured membranes lengthens.<sup>19</sup> Routine antibiotics for all women are not recommended. Chorioamnionitis occurs during labor, and providers need to be suspicious when a woman develops a fever in labor, or maternal or fetal tachycardia. Therefore, it is important to diagnose the condition early when suspected. Immediate treatment of chorioamnionitis with antibiotics is essential in preventing neonatal sepsis. Clinical signs of chorioamnionitis include maternal fever, increase in fetal heart rate, uterine tenderness and

foul odor of the amniotic fluid. Beginning antibiotics as soon as possible, without waiting to obtain cultures, significantly improves the outcome for the neonate.<sup>20</sup> A combination of antibiotics that cover both gram-positive and gram-negative organisms is important. (There is no clear evidence on the choice of specific antibiotics.<sup>21</sup>)

Although early onset GBS sepsis in the newborn is rare, such infection does occur. Although 15–45% of healthy women are colonized with GBS, and newborns can acquire the organism vertically in utero or during delivery from the maternal genital tract, only 1–2% of colonized neonates go on to develop invasive GBS disease.<sup>22</sup> To prevent GBS infection of the newborn, intrapartum antibiotics should be given to all women who have tested positive to GBS screening after 35 weeks of gestation, who previously gave birth to an infant with invasive GBS disease, who are giving birth at more than 37 weeks' gestation, or who have a fever of 100.4 degrees Fahrenheit or 38.0 degrees Celsius (as well as to those with PROM or chorioamnionitis as described above). The treatment recommended by the U.S. Centers for Disease Control and Prevention (CDC) is penicillin G, 5 million units IV initial dose, then 2.5–3.0 million units IV every four hours until the birth; or ampicillin, 2 g IV initial dose, then 1 g IV every four hours until the birth.<sup>23</sup> When penicillin, ampicillin or cefazolin prophylaxis was administered for four or more hours before delivery to women delivering at more than 37 weeks' gestation, antibiotic prophylaxis was 78% (95% CI: 44–91) effective in preventing early-onset GBS disease (CDC, unpublished data, 2009).

## Immediate Newborn Care: Breastfeeding, Cord Care and Eye Care

Appropriate care of the newborn at the time of delivery can reduce newborn infection. Early initiation of exclusive breastfeeding is a natural way to provide antibodies that will protect the newborn from both intestinal and respiratory tract infections. Pneumonia and diarrhea remain major causes of neonatal death, and both are reduced with exclusive breastfeeding.<sup>24</sup> Likewise, it can help protect from the introduction of various contaminated substances either as feeds or as pre-lacteal ritual ingestion.

A substantial proportion of newborn deaths from infection are from cord infection, most commonly related to use of unclean cutting and tying of the umbilical cord.<sup>25</sup> Infants with neonatal tetanus, which kills 165,000 infants each year, often have a concomitant cord infection,<sup>26</sup> which points to a common cause (i.e., unclean delivery and cord care practices). Clean cord care at birth and in the days following birth is effective in preventing cord infections and tetanus neonatorum. Strategies to reduce the risk of neonatal tetanus and cord infections include promoting clean delivery and clean cord care and increasing tetanus toxoid immunization coverage in women of reproductive age. Clean cord care practices at birth include washing hands with clean water and soap before delivery and cutting and tying the cord, laying the newborn on a clean surface and cutting the cord with a sterile instrument, and using a clean tie or clamp on the cord, combined with tetanus toxoid immunization during pregnancy. In rural Nepal, newborn mortality was reduced by 19% when the birth attendant washed his/her hands before assisting at the birth.<sup>27</sup> Furthermore, there is a growing body of evidence from South Asia that application of a solution of dilute chlorhexidine (4%) to the umbilical cord stump as a routine part of immediate newborn care can substantially reduce newborn infection and mortality.<sup>28</sup>

Eye care at birth is intended to reduce blindness caused primarily by chlamydia and gonorrhea infection in the eye of the newborn (ophthalmia neonatorum, or ON). Worldwide, 1,000–4,000 newborn babies become blind every year because of ON. The prevalence of ON varies considerably around the world. Although silver nitrate solution instilled in the eyes immediately after birth is effective for gonorrhea organisms, most countries have now switched to povidone-iodine, tetracycline 1% or erythromycin 0.5% ointment to prevent ON. Routine, immediate postpartum care of the newborn should include wiping fluids and mucus from the

newborn's eyes and instilling an antiseptic eye solution or ointment. It must be noted that although antibiotic eye ointment is effective for gonorrhoea, it is less effective for chlamydia. For both, the most important way to reduce this infection in newborns is by screening and treating mothers in pregnancy and by observing newborns for symptoms.<sup>29</sup>

## Program Considerations for Implementing Intrapartum Practices That Reduce Risk of Neonatal Sepsis

Any facility-wide or nationwide program that intends to reduce newborn mortality rates must include careful attention to practices during labor and birth. A successful program requires data to inform decision-making. Information that programs should ideally collect in order to make informed, evidence-based decisions in program design and implementation include:

- Incidence of newborn infection
- Incidence of chorioamnionitis
- Local organisms cultured from the amniotic fluid of mothers with chorioamnionitis
- Local organisms cultured from the infected newborn
- Antibiotics used in treatment of chorioamnionitis, and information about any emerging resistance
- Antibiotics used in the treatment of newborn infection, and any emerging resistance

As with any broad-based intervention, the community has an important role to play in the reduction of newborn sepsis. Women, community birth attendants and other key community members must understand the principles and practices described above under “Hygiene.” Communities should be involved in birth preparedness so that the necessary supplies for infection prevention are available for every home birth. When women and communities understand the danger signs for infection in pregnant women, the significance of fluid leaking from the vagina before labor begins and the importance of seeking care immediately, they can actively help prevent infection in the newborn. Community mobilization and behavior change communication strategies are powerful means for ensuring that practices and care-seeking behavior of women in their communities reduce the risk of infection in their newborns. Mothers and their families should also know of the importance of provider handwashing, limited vaginal examinations and use of HLD gloves when examinations are done. When consumers expect health providers to practice hand hygiene, it is more likely to occur.

The mother and newborn form a dyad, and the well-being of the mother at the time of birth directly determines the well-being of the newborn at birth. Any efforts, whether programmatic or clinical, to reduce sepsis in the newborn must address the conditions and practices that surround labor and birth.

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<sup>2</sup> Ibid.

<sup>3</sup> Klebsiella and E. coli are found in the maternal intestinal tract; GBS is found in the mother's vagina and urinary tract, S aureus is found on the skin.

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<sup>5</sup> Ganatra HA, Stoll BJ and Zaidi AKM. 2010. International perspective on early-onset neonatal sepsis. *Clinical Perinatology* 37: 501–523.

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