

## Step 1: Analyze the Situation

### Health and Commodity Context

*\*The majority of the information in this section is a global-level analysis for purposes of illustration. The country-specific situation analysis should be focused on the local context.*

#### Health Context

Neonatal mortality is highest by far in Sub-Saharan Africa (32 per 1000 live births, UNICEF 2013) and South Asia (31 per 1000 live births, UNICEF 2013). Globally, neonatal infections are estimated to account for over 1 million newborn deaths annually (over a third of the total burden). The newly cut umbilical cord is an entry point for bacteria that cause newborn sepsis and death and may also lead to cord infection (omphalitis) that can spread to surrounding tissues and the blood stream.

Since at least 1998, the World Health Organization (WHO) has advised use of antiseptics for cord care in unhygienic conditions. Unhygienic conditions are often found in places with high neonatal mortality. New guidelines (<http://apps.who.int/iris/handle/10665/97603>) published in 2013 strengthen that advice and specifically recommend 7.1% chlorhexidine digluconate delivering 4% chlorhexidine. Newborn care policies—and cord care guidelines, specifically—vary by country, and practices within countries may not reflect national policy. This is particularly true with home/community births but is also the case in many facility births. Proper cord care may or may not be taught during ANC or in the hours after birth in health facilities. When taught, health professionals, despite their strong influence: 1) might not address cord care consistently, 2) might recommend sub-optimal cord care methods and substances, 3) might not be aware of certain harmful traditional cord care practices or the extent to which they are practiced, and 4) might not have a chance to influence women who give birth at home or do not attend ANC.

Millions of mothers and health providers around the world continue to have a strong desire to apply something to the umbilical cord stump, and putting nothing on the cord stump is simply unacceptable in some cultures or communities. In the absence of a specifically recommended product, they use a variety of traditional and non-traditional substances. Substances are applied to the cord stump for a number of reasons, including, but not limited to: preventing or treating infection; drying, lubricating, softening, protecting, or healing the cord stump; accelerating cord detachment; and following traditional practices. However, not all of these substances are clean or hygienic,

potentially increasing infection risk (Tuladhar et al., 2007; Waiswa et al., 2008). Further, the infant may be exposed to unsanitary conditions, in general, in both communities and facilities.

Substances used vary by region and country. In Sub-Saharan Africa, substances used have been found to include: breast milk, Vaseline®, cooking and motor oil, mabono (a wild fruit) oil, or cream from sour milk to lubricate the cord; baby powder, charcoal dust, dried cow dung, dried chicken droppings, dust from the threshold of the home, ash from a burnt pumpkin handle, crushed loma (wasp nest) or mud to dry the cord; breast milk, alcohol, python snake oil, banana, cow dung, mukunku (bark of a tree), traditional herbs, and the dirt from pounding stick to medicate the cord in the event of redness or pus; and methylated spirit, baby lotion, antibiotic ointments, menthol-containing creams, toothpaste, hot balms, shea butter, juice from the pou plant, salty water, soapy water, and various herbal preparations for varied reasons (Herlighy et al., 2013; Opara, et al., 2012; Joel-Medawasi et al., 2008; Moyer et al., 2012; Waiswa et al. 2008). In South Asia, mustard seed oil, turmeric, hing, jwano, onion, garlic, butter, other oils, powder, penicillin, sindoor, ash (unspecified type), ash of cow dung, boric acid powder, coconut oil, homeopathic medicines, Dettol or Savlon (antiseptics), earth from clay ovens, heat, antibacterial ointments, ginger, and chewed rice are among the substances found to be used for cord care (Tudahar et al., 2007; Moran et al., 2009; Alam et al. 2008). Different substances may be applied at different times depending on the condition of the cord and may be applied alone or in combination. Many of the substances used are actually or potentially harmful when applied to the cord stump. Even substances that may seem to be benign or beneficial can become harmful if not prepared, stored, and applied hygienically, and they might be contraindicated for certain groups such as premature infants.

Chlorhexidine digluconate is a widely used, low-cost medicine effective against major agents of neonatal infection. Since its introduction in the 1950s, it has been used regularly as a surgical and oral antiseptic and carefully studied for safety and efficacy. WHO has recognized chlorhexidine as a suitable antimicrobial for cord care where necessary and especially to displace harmful cord care practices. As described in more detail below, daily application of 7.1% chlorhexidine digluconate to the cord stump has been shown to reduce neonatal sepsis and death in community-level studies and to be an acceptable substitute for other substances.

### Commodity Context

## Product Summary:

Drug:	Chlorhexidine gluconate (also called Chlorhexidine digluconate or just Chlorhexidine)
Proposed Indication:	Antiseptic for umbilical cord care
Formulation:	7.1% chlorhexidine digluconate aqueous solution or gel, delivering 4% chlorhexidine for umbilical cord care
Dose:	3 grams of gel for single day application (as currently practiced in Nepal) or 10ml of aqueous solution for single day application.
Avg. Cost:	Less than US \$0.50 for single day application.

Chlorhexidine digluconate—used to make a variety of chlorhexidine finished products—is readily available on every inhabited continent at low cost. Dozens of manufacturers around the world make chlorhexidine-based products, at concentrations from <1% to 20% for various applications. The finished product for care of the umbilical cord stump (7.1% chlorhexidine digluconate, delivering 4% chlorhexidine) has a very low cost for raw materials per baby. Chlorhexidine has no toxicity risks and virtually no potential for misuse. It has a long shelf life, requires no cold chain, and is extremely easy to apply with minimal training and no equipment. These factors make it suitable for hospital, health center, and home care alike. Few other interventions have demonstrated such potential for rapidly reducing newborn mortality across so many settings for such a low cost.

In July 2013, WHO included 7.1% chlorhexidine digluconate (delivering 4% chlorhexidine) for umbilical cord care on the WHO Model List of Essential Medicines for Children. In October 2013, WHO issued new guidelines for umbilical cord care that recommend daily application of 7.1% chlorhexidine digluconate to the umbilical cord stump for the first week of life in areas with high neonatal mortality.

Chlorhexidine for cord care typically adds 1-2 days to the time it takes the cord stump to fall off. This happens because antiseptics like chlorhexidine retard bacterial colonization and infiltration of white blood cells into the site (Ente et al 1991). Most women (and families and communities) value speedy detachment of the stump, so communication strategies, messages, and materials should anticipate and address the issue of potential delay.

Where consumer research has been conducted, mothers have shown a strong latent demand for a purpose-made antiseptic like chlorhexidine, have demonstrated the ability to use chlorhexidine correctly, and have accepted that chlorhexidine increases the time for cord detachment by 1-2 days.

Recent community-level randomized controlled trials in Nepal, Pakistan, and Bangladesh have shown that applying a 7.1% chlorhexidine digluconate (delivering 4% chlorhexidine) product to the umbilical cord saves lives (Mullany et al., 2006; Soofi et al., 2012; Arifeen et al., 2012). Across the three countries, data from over 54,000 newborns showed an aggregate 23% reduction in neonatal mortality (not including deaths in the first few hours of life) and a 68% reduction in severe infections for the chlorhexidine intervention groups. These are some of the largest effect sizes seen in any neonatal intervention (UN Commission Report, 2012). Similar trials are underway in Tanzania and Zambia, with results expected in 2014. It is estimated that chlorhexidine has the potential to reduce overall newborn mortality risk by up to 18%, resulting in over half a million newborn lives saved (UN Commission Report, 2012; Hodgins, 2013).

### **Audience and Communication Analysis**

A recent evidence review found 11 documents related to demand generation for chlorhexidine for cord care, all of which were published in peer-reviewed journals and were published from 2005 to 2013. Three studies took place in Nepal, five in Bangladesh, and one in Pakistan. Two documents from India described a summary of consumer research related to chlorhexidine and an end-to-end analysis focusing on Uttar Pradesh. Chlorhexidine study results from Tanzania and Zambia were not available at the time of the review. A review of 13 additional studies, of which at least 12 were reported in peer-reviewed journals, provided information on barriers and opportunities in Africa.

**Individual level**

In the literature reviewed, mothers were the principal providers for skin and cord care during the neonatal period. Traditional cord care practices and lack of access to knowledge about new interventions such as chlorhexidine are two key barriers at the individual level.

Research in Bangladesh and Nepal reveal several unhygienic cord care practices. In Bangladesh, more than half of families surveyed applied substances to the stump after cord cutting of which turmeric and boric powder were the most common (83% and 53% respectively). Other substances applied were mustard oil, ash, Dettol, coconut oil, Nebanol ointment, ginger, and chewed rice (Alam, 2008). This research also showed that approximately 40% of newborns were bathed on the day of birth and umbilical stump care included bathing, skin massage with mustard oil, and heat massage on the umbilical stump (Alam, 2008). Similar traditional cord care practices were found in Nepal. The application of heated mustard oil mixed with different other substances over the cord stump after cutting the cord and over the first week of birth was a very common practice in all the study castes (Tuladhar, 2007).

In the African studies reviewed, mothers also provided most newborn skin and cord care, and dry cord care was rare. In Nigeria, the mother's education level was the main predictor of beneficial cord care (Abullimhen-Iyoha, 2012; Opara, 2012). In a study where most respondents gave birth in a facility, received ANC, and were advised about cord care, 95.3% of respondents cleaned the stump with methylated spirit, but 32.4% applied additional substances to the stump (Opara, 2012). Nurses were most influential regarding cord care (51.3%), followed by the maternal grandmother (32%), and paternal grandmother (5.8%) (Abullimhen-Iyoha, 2012). In Tanzania, mothers and babies stay at home until the cord falls off in order to protect the newborn from witchcraft (Mrisho, 2008). Many of the substances applied to cord stumps in Africa are highlighted above in part 1 of the Situation Analysis, but include antiseptics, liquids, oils, powders, ashes, and herbal preparations.

**Family/community level**

The literature also showed that family and community norms strongly influence cord care practices. Deeply held beliefs about umbilical cords and their care need to be addressed community-wide. Winch and colleagues (2005) and Alam (2008) found that in Bangladesh, mothers, grandmothers, and other female caregivers feel that traditional practices like the application of mustard oil to the cord are

essential to protect the neonate from cold and associated health problems. In Bangladesh, caregivers were also concerned about the timing of separation of the umbilical cord and became worried if it did not fall off after seven days.

In Uganda, dry cord care was found to conflict with spiritual beliefs attached to the use of local herbs (Byaruhanga, 2011). Grandmothers play a key role in determining cord care practices in the countries studied, especially with young mothers. Other family and community members are also involved in newborn care; these include sisters, older children, and neighbors. Family networks are a key source of information about cord care (Mangwi, 2013). In Zambia and elsewhere, the length of time to cord detachment was of near-universal concern (Herlihy, 2013).

#### **Society level**

At the society level, it is important to consider if and how much autonomy mothers have to make decisions about health care, including where and with whom to give birth, and how to care for the cord stump. Lack of access to a source of chlorhexidine is also a significant factor. In Bangladesh, India, and Nepal, a majority of births take place at home, often with the help of untrained or minimally trained birth attendants who are not knowledgeable about, or equipped with, chlorhexidine. Chlorhexidine is also not usually included in the clean delivery kits, when available, for home births.

#### **Health system level**

Barriers are also present at the health system level. Although financing for chlorhexidine is a barrier, a study conducted in rural Bangladesh highlighted the willingness of 1,717 couples to pay for three types of topical antiseptic products (single-dose liquid, multi-dose liquid and gel preparation) containing 7.1% chlorhexidine digluconate that could prevent umbilical cord infections in newborns. The majority of respondents were not willing to pay the preset prices asked for any of the products, but all respondents were willing to pay some amount of money for the product they preferred. Most respondents were also willing to borrow money to cope with higher prices in order to prevent neonatal infection, which indicates a high level of motivation among these potential users. The study found that a unit price of multi-dose 7% chlorhexidine digluconate liquid between Taka 15-25 (US \$0.21-0.35) would be affordable to the primary intended population in rural Bangladesh (ICDDR, 2012). Sold at this price, this product would be expected to generate a large market. Pre-market

research in Bangladesh showed that pharmacists were interested in distributing chlorhexidine provided that it was recommended by physicians (RTM International, 2009).

Chlorhexidine for umbilical cord care would be classified by national regulatory agencies as a medicine, adding a regulatory hurdle to overcome before making it widely available. In addition, chlorhexidine at the recommended concentration for umbilical cord care is a new intervention and therefore requires revision of standard treatment guidelines and use as well as inclusion in national essential medicines lists.

In general, ANC and skilled providers were found to play a limited role in teaching about cord care (or newborn care overall). The quality of ANC—including health education and especially newborn care education—were major impediments to beneficial cord care (Mangwi, 2013). In Egypt, only half of mothers received newborn care advice during ANC visits, and only half of these received advice on cord care (Darmstadt, 2008). Given the large proportion of home births, especially in rural areas, health systems may need to be willing and able to work with traditional birth attendants (TBAs) to improve cord care and other essential newborn care (ENC) practices. A disconnect found between health providers and communities indicates the need for providers and communities to work together to develop strategies to improve care and outcomes (Moyer 2012). In Uganda, communities and providers found recommended newborn care practices acceptable, but barriers such as pregnant women not understanding the value of early and frequent ANC for women who did not feel sick, the cost of drugs and supplies, the lack of post-natal care, and the rejection of dry cord care by both health providers and parents often prevented the uptake of recommended newborn care practices (Waiswa, 2008).

### **Production and Distribution**

Chlorhexidine can be delivered through existing health services and initiatives such as antenatal and delivery care, and postnatal care in the first days and week of life. It can also be provided through retail outlets such as pharmacies, providers working in public facilities and/or communities (e.g., traditional birth attendants), and community health workers who have contact with pregnant women.

Efforts are underway to expand production of 7.1% chlorhexidine digluconate (delivering 4% chlorhexidine) in the developing world in order to meet expected demand.

The formulation of the chlorhexidine product should also be considered before large-scale dissemination. Results of two studies in Nepal indicate that chlorhexidine in the form of a gel, liquid, or lotion was most acceptable to users (ICDDR, 2012; Tuladhar, 2007). Results from a hospital-based randomized trial of chlorhexidine gel and solution suggest that satisfaction and compliance were high for both products and that the gel formulation was not inferior to the liquid (ICDDR, 2012). The formulations of chlorhexidine available on the market are an aqueous solution (liquid) and a gel. It is strongly recommended that countries conduct a user preference study prior to selecting the formulation for distribution.

**Example of Table to Organize Key Information**

	<b>Current Behaviors</b>	<b>Primary Barriers to Desired Behavior</b>	<b>Primary Benefits of Desired Behavior</b>
<b>End-user/community members (e.g. women, families)</b>	Millions of mothers and health providers around the world apply a variety of traditional and non-traditional substances to the umbilical cord stump for any number of clinical and cultural reasons. However, not all substances adequately protect the infant and the site from infection.	Very limited knowledge of new interventions for neonatal health  Prevalence of/preference for culturally significant cord treatments  Low levels of attended or	Very effective in preventing neonatal sepsis and death  Acceptable substitute for other substances  Zero-toxicity, and virtually no possibility for misuse



		<p>facility births</p> <p>Unwillingness to pay (full price) for the commodity</p> <p>1-2 day delay for cord to fall off</p>	
<p><b>Providers (incl. public and private, clinic- and community-based)</b></p>	<p>Low levels of promotion and insertion/use of chlorhexidine</p>	<p>Low levels of knowledge of commodity</p> <p>Poor availability of commodity</p>	<p>Method easily incorporated into clean delivery kits</p> <p>Multiple level of service providers can administer</p>