Abstract of the dissertation entitled

An evidence-based guideline
of using dry care approach for umbilical cord care in newborn

Submitted by

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As a baby is born, the umbilical cord is cut and clamped, then it dries up and detaches. During the course of cord detachment and before the wound completely heals up, umbilical cord care is essential for preventing any local infection, which may lead to septicemia or infection of other organs.

However, the yellowish and blood-stained discharge from the base of the cord and the appearance of the cord stump often causes anxiety among parents and make them hesitant to provide cord care. Hence, healthcare professionals are responsible for explaining the importance of proper cord care and provide consistent information on the course of cord detachment. This will decrease parental anxiety or the cord-related issues and improve compliance.

Currently, different solutions are being used at different healthcare facilities. This leads to confusion among healthcare professionals and parents. Moreover,
as evidenced in many studies, different solutions can affect the umbilical cord detachment time and prolongation of umbilical cord separation time, which can cause immense anxiety among the parents. Hence, a solution that is effective in reducing the umbilical cord separation time can help to alleviate parental anxiety. Dry care, such as using cold boiled water to clean the cord, is suggested to be suitable for umbilical cord care as it shortens the umbilical cord separation time compares to alcohol, which is still being used in many healthcare facilities. Therefore, this proposed innovation attempts to promote dry care as the standard umbilical cord care practice, to shorten the umbilical cord separation time, which in turn, decreases parental anxiety and the workload related to cord care for the healthcare professionals.

The implementation of dry care was explored and it was found that this innovation is cost-effective and has a high transferability and feasibility in the current setting of Hong Kong Maternal and Child Health Clinics. An evidence-based practice guideline was developed and would be launched initially on a trial basis at one of the Maternal and Child Health Clinics after a well-developed communication and implementation plan is established. It is expected to take about 12 months from gaining approval, implementation of the innovation, data collection and to the last stage, program evaluation.
An evidence-based guideline

of using dry care approach for umbilical cord care in newborn

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A dissertation submitted in partial fulfilment of the requirements for
the degree of Master of Nursing
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Declaration

I declare that this thesis represents my own work, except where due
acknowledgement is made, and that it has not been previously included in a thesis,
dissertation or report submitted to this University or to any other institution for a
degree, diploma or other qualifications.

_________________________________________

WONG PUI LAI
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Chapter 1

Introduction

During pregnancy, the umbilical cord serves as a linkage between the placenta and the fetus. It contains two arteries and one vein, allowing the transportation of oxygen and all the essential nutrients to the fetus for growth (McInerny, 2009). After birth, umbilical cord care becomes one of the critical focuses of nurses and parents. The aim is to prevent and to detect any early signs of hemorrhage, infections or cord-related complications (Wong, 2006).

1.1 Background

1.1.1 Physiology of umbilical cord detachment

In developed countries, the umbilical cord is cut and occluded with sterile plastic clamp using sterile technique after aseptic delivery procedures (Lowdermilk, 2012). The umbilical cord, then, becomes devitalized and shrinks to a hard, dark-brown eschar, called the cord stump. This devitalized umbilical cord is quickly colonized with bacteria, which triggers phagocytosis and the aggregation of lymphocytes and enzymes, facilitating the detachment of the cord stump (McInerny, 2009). The time for separation vary, the expected range is between five to fifteen days and heal up by 8 weeks old, commonly one to three weeks, and longer in premature babies (Lowdermilk, 2012; McInerny, 2009;
Transient spotty bleeding would be noted after the cord stump separates (McInerny, 2009).

1.1.2 Significance of cord care

Before the cord stump detaches, the necrotic tissue around it provides a nutritious medium for bacterial growth (Wong, 2006). Since 1940s, after the adoption of nurseries in hospitals, pathogens from caretakers and the environment caused an increased risk of colonization and infections (Pezzati, Biagioli, Martelli, Gambi, Biagiotti & Rubaltelli, 2002; Mullany, Arifeen, Winch, Shah, Mannan, Rahman, Rahman, Darmstadt, Ahmed, Santosham, Black & Baqui, 2009). If the bacteria travel via bloodstream and connective tissue, local cord infection could lead to septicemia or infection of other organs (Kapellen, Gebauer, Brosteau, Labitzke, Vogtmann, & Kiess, 2008; McInerny, 2009; Mullany et al., 2009). Globally, around 1 million newborns die of infection due to bacteria entering the body via the umbilical cord (Vural & Kisa, 2006). Most infections with hospital-acquired bacteria occur after the newborn is discharged (WHO, 1998). Locally, according to observation at one of the Maternal and Child Health Centers, there are about 2 to 3 suspected cases of cord infections detected per month. This demands the needs for rigorous cord care regimen as a kind of preventive nursing care (Pezzati et al., 2002; Shoaib, All, & El-Barrawy, 2005).
1.2 **Affirming needs**

Umbilical cord care practice varies socially, economically, geographically between different countries and cultures (Mullany et al., 2009; Kapellen et al., 2008). In different regions worldwide, triple dye, antiseptic such as 4% chlorhexidine, antibiotic such as Rikospray or more traditional methods such as olive oil and human milk are being used as topical agents for umbilical cord care (Ahmadpour-Kacho, Zahedpasha, Hajian, Javadi & Talebian, 2005; Janssen, Selwwod, Dobson, Peacock & Thiessen, 2003; Kapellen et al., 2008; Pezzati et al., 2003; Mullany et al., 2009; Vural & Kisa, 2006). There is still no conclusion on the best universal umbilical cord care practice (Mugford, Somchiwong & Waterhouse, 1986; WHO, 1998). Even in Hong Kong, there is a variation.

1.2.1 **Inconsistent cord care practice**

In Hong Kong, according to a study done in one of the Maternal and Child Health Centers (MCHC) in 2009 (Appendix 1), 82 out of 84 infants, 97.6%, who were born in the hospitals under the Hospital Authority, had their umbilical cord treated with water, compared to 6.9% from private hospitals. One the other hand, 27 out of 29 infants, 93.1%, from private hospitals had their cord treated with alcohol, compared to 2.4% from public hospitals. From the above study, we can see that most general practitioners in the private setting tend to suggest using
alcohol; while hospitals under the Hospital Authority tend to suggest cold boiled water. In the leaflets given out by MCHC (Department of Health, 2010), both methods are suggested and there is a variation in umbilical cord care among different centers. This inconsistent information on umbilical cord care practice could lead to confusion and incompliance among the caretakers, and they might have doubts about the method taught by the health care professionals.

1.2.2 *Effect of alcohol versus dry care*

There is still much debate on the suitable substance for umbilical cord care. The dehydration effect of alcohol had been suggested to be damaging to the surrounding skin tissue and may cause skin burns in neonates (WHO, 1998). Alcohol can destroy the normal flora existing near the umbilicus. This destruction is believed to alter the natural healing process (Barclay et al., 1993), and hence delay cord separation (McInerny, 2009; WHO, 1998; Vural & Kisa, 2006; Zupan, Garner & Omari, 2009). Before the stump can be detached, healed up and covered by a skin by three to four weeks (McInerny, 2009), there is an open access at the base of the stump that allows the entry of bacteria (Kapellen et al., 2008) and hence, delayed cord separation time may lead to increased risk of infection (Ahmadpour-Kacho et al., 2005). This further, increases medical cost (Vural & Kisa, 2006; Hsu, Yeh, Chuang, Lo, Cheng & Huang, 2010). Alcohol
toxicity might happen as a result of misusage, symptoms include hemorrhagic skin necrosis, dysfunction of the central nervous system, metabolic acidosis, and hypoglycemia (McInerny, 2009; Vural & Kisa, 2006).

On the other hand, dry care decreases skin irritation (WHO, 1998). It is easily available and cost-effective compared to alcohol. According to a systematic review of randomized controlled trials on various cord care methods, dry care was shown to shorten cord separation time (Zupan et al., 2009). In places with advanced technology and where aseptic technique is practiced during delivery procedures, antiseptic agent is deemed not necessary for cord care (WHO, 1998). In addition, under the system of 24-hour rooming-in, where the mother is the main caretaker (Kapellen et al., 2008; WHO, 1998), it is found that colonization of normal flora on the skin around umbilicus mainly comes from mother’s skin (Pezzati et al., 2002). The heightened awareness of standard precautions and better knowledge in disease transmission, leads to a reduction in bacterial cross-contamination and infection has become a rare event (McInerny, 2009). It is recommended that antiseptic is likely unnecessary as to lower the risk of cord contamination (WHO, 1998).

According to the same study carried out in one of the MCHCs in 2009, which was mentioned above (Appendix 1), the umbilical cord separation time was
less than seven days among 65.5% of the newborns with their cord treated with cold boiled water (dry care) but 0% for the alcohol group. 68.9% of newborns in the alcohol group had their cord separation time falling between seven to twenty days but only 34.5% in the dry care group. No newborns in the dry care group compared to 31.1% of the alcohol group had their cord detached after twenty days.

1.2.3 Parental concerns

Umbilical cord care has always been the primary concern for mothers after hospital discharge. From experience, when parents come to the MCHC for the first time, most parents show concerns and have enquiries on the method and solutions used for cord care. In the progress notes, it is a critical item that nurses must carry out cord assessment and documentation at the first visit for newborns. Umbilical cord care is considered as one of the first essential care items to be learnt by parents besides bathing and feeding.

According to Ford (1999), prolongation of umbilical cord separation time, discharge and odor from the umbilical cord can cause immense anxiety in parents. In Hong Kong, where most healthy newborns are ready to be discharged at around day two to three, umbilical cord care must be continued at home. As suggested by Ford (1999), if rationales on using the suggested method are explained to
caretakers, it can promote their willingness to continue the recommended treatment. It is crucial for health care professionals to provide accurate, consistent and relevant cord care information on umbilical cord care to alleviate maternal concern (Ford, 1999).

There is a variety of umbilical cord care practice identified and studied worldwide, yet, the two most commonly practiced methods in Hong Kong are cold boiled water and alcohol. The inconsistent practice in private and public healthcare settings has caused confusion in parents and difficulties for healthcare providers to implement cord care education. Hence, an answerable and searchable question on umbilical cord care is asked in the PICO format.

**1.3 Research Question**

Is umbilical cord separation time shorter in full term newborns when using dry care compared to alcohol?

Population identified is full term newborns, the intervention is alcohol and the comparison group is dry care, such as using water as cleansing agent. The outcome to be measured is umbilical cord separation time. Umbilical cord separation time (UCST) is used as the primary endpoint in many studies as this is important for parental care (Kapellen et al., 2008).
1.4 Objectives

1) To conduct a comprehensive literature search for empirical evidence of effectiveness in using dry care approach in umbilical cord care

2) To extract information from the chosen literatures

3) To critically assess the quality of the chosen literatures

4) To summarize and synthesize data extracted from the literatures

5) To come up with recommendations using the best evidence available

1.5 Significance

Besides proper hand and environmental hygiene, suitable cord care during the healing period is critical in preventing any cord-related complications. Since 1998, the WHO established umbilical cord care recommendations at birth and after discharge from the hospital that are currently being practiced in developed countries (Pezzati et al., 2002).

To sum up, appropriate umbilical cord care not only can facilitate cord detachment, reducing the time to cord separation, it can also promote comfort in newborns by minimizing the chance of skin irritation and contamination (WHO, 1998).

With clear and consistent instruction received from health care professionals, parental anxiety can be alleviated (Ford, 1999). Parents will be more confident
in handling the umbilical cord care and will pay fewer visits to the MCHCs.

For healthcare professionals, the establishment of a standardized guideline allows the delivery of cord care instruction with consistency and confidence. If advice on cord care is effectively delivered, workload is decreased as parents will not need to revisit the MCHCs as frequently. The postnatal cost will also be reduced (Vural & Kisa, 2006).
Chapter 2

Critical Appraisal

2.1 Search strategies

Three electronic databases (Appendix 2), PUBMED, Medline (Ovid SP) and Cochrane Library, were used.

The last search date was 30th July, 2012. The same keywords were used in Medline (Ovid SP) and PUBMED. The keywords used were “umbilical cord”, “umbilical cord care”, “randomized controlled trials” (RCTS) and limited to English paper. No limit on the publishing year was set as a goal to retrieve more relevant studies. Titles of the searched paper were reviewed, 16 studies were yielded from PUBMED and 8 studies from Medline (Ovid SP). After combining the results from the two databases, 5 literatures were overlapped and gave a total of 19 studies. Inclusion and exclusion criteria were, then, set to limit my search when reviewing each abstract of the 19 studies. The target populations are full-term healthy babies. The studies must contain a comparison of alcohol and dry care with UCST as the outcome measure. All the studies done on pre-term babies are excluded.

Nine studies were found using the keyword “umbilical cord care” in the Cochrane Library and only one was relevant.
2.2 Results

Through revision of the abstracts of the 19 studies from PUBMED and Medline (Ovid SP) according to the above-mentioned inclusion and exclusion criteria, 2 studies were chosen (Pezzati et al., 2002; Dore, Buchan, Coulas, Hamber, Stewart, Cowan & Jamieson, 1998). After reviewing the reference list of the systematic review of RCTs found in the Cochrane library, manual search was done. Using the same criteria aforementioned, five studies were finally selected, giving a total of seven eligible studies.

Four of the eligible studies are randomized controlled trials (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998; Medves & O’Brien, 1997), and three are quasi-experimental studies (Bourke, 1990; Guala, Pastore, Garipoli, Agosti, Vitali & Bona, 2003; Shoaeib et al., 2005).

2.3 Data extraction and quality assessment

Following the careful revision of each selected literature, data were extracted and put into the form of table of evidence (Appendix 3 – 9). Data included in the table of evidence are citation of each study, study design, patient characteristics, intervention and comparison, usual care, length of follow-up, outcome measures and effect size.

According to the hierarchies of evidence proposed by Melnyk and
Fineout-Overholt (2005), the four RCTs (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998; Medves & O’Brien, 1997) are rated as level II evidence and the three quasi-experimental studies (Bourke, 1990; Guala, Pastore, Garipoli, Agosti, Vitali & Bona, 2003; Shoaeib et al., 2005) are ranked as level III evidence.

Each study underwent a thorough quality assessment using an assessment tool, the Scottish Intercollegiate Guideline Network (SIGN). The checklist is consisted of two parts, internal validity and an overall assessment of the study (Appendix 10).

2.3.1 Randomized controlled trials

All four selected studies (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998; Medves & O’Brien, 1997) clearly described the background information of umbilical cord care significance, affirmed its needs, and provided a well-defined research question. Only two studies (Pezzati et al., 2002; Dore et al., 1998) described the randomization process in detail while the other two (Hsu et al., 2010; Medves & O’Brien, 1997) did not give sufficient details. Dore et al. (1998) used an adequate concealment method by using opaque envelops. Hsu et al. (2010) and Medves & O’Brien (1997) did not report the concealment method.

Blinding is difficult in umbilical cord care study as parents and health care workers are involved in giving the specific treatment. Hence, in three studies
(Dore et al., 1998, Medves & O’Brien, 1997 and Pezzati et al., 2002), blinding was done at microbiologist level. Microbiologists were responsible in analyzing colonization, and they do not belong to the research team (Dore et al., 1998; Medves & O’Brien 1997; Pezzati et al., 2002). In one study (Dore et al., 1998), assessors of the cord condition were blinded as well. They were not in the research team and were not aware of the study.

Similarities between the intervention and control groups at the beginning of the trial were well addressed. Only one study (Hsu et al., 2010;) provided the p-value of each demographic characteristic to show the homogeneity among participants and hence with a higher rating; while three other studies (Dore et al., 1998; Medves & O’Brien, 1997; Pezzati et al., 2002) only showed the number of participants and percentage of each characteristic in both groups. In all four studies (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998; Medves & O’Brien, 1997), the only difference between the two groups was the intervention under investigation. The outcomes such as UCST, infection rates, parental satisfaction were all measured in a standard, valid and reliable way. The drop-out rate was less than 10% in all four studies. Drop out reasons include lost to follow-up (Hsu et al., 2010; Medves & O’Brien, 1997), breached protocol when alcohol was used under the pressure of relatives or as advised by other health care
professionals (Hsu et al., 2010; Dore et al., 1998; Medves & O’Brien, 1997), and admission to the neonatal intensive care unit (Medves & O’Brien, 1997). Two studies (Dore et al., 1998; Medves & O’Brien, 1997) used intention-to-treat, in which the drop-out participants remained in the groups they were randomly assigned to in the analysis. Only one study (Dore et al., 1998) was carried out in two sites and the results were comparable for all sites.

Two studies were rated 2++ (Pezzati et al., 2002; Dore et al., 1998) as they achieved over 70% of the items in the list and with well or adequately address on critical items such as randomization, similarity of subjects before treatment and elimination of confounding factors. Two studies (Hsu et al., 2010; Medves & O’Brien, 1997) were rated 2+ as they only got significant emphasis in 60% of the items.

2.3.2 Quasi-experimental studies

Two studies (Bourke, 1990; Shoaeib et al, 2005) had a thorough description of the background and a focused research question. Only one study (Bourke, 1990) emphasized blinding where the mothers and community child health nurses were kept blinded. The similarity between the treatment and control group at the start of the research was not mentioned in one study (Bourke, 1990) and were adequately and poorly addressed in the other two studies as only convenient
samples were obtained (Guala et al., 2002; Shoaeib et al., 2005). The difference between groups is not only the treatment but also the delivery mode, maternal age and level of education hence this might contribute to bias in UCST and compliance. The outcomes such as UCST, infection rates, parental satisfaction were all measured in a standard, valid and reliable way. The drop-out rate is zero in all three studies (Bourke, 1990; Guala et al., 2002; Shoaeib et al., 2005). Only one study (Shoaeib et al., 2005) carried out their research at two different locations, and the results were comparable in both sites.

The three studies (Bourke, 1990; Guala et al., 2002; Shoaeib et al., 2005) are rated 3- due to the lack of randomization and emphasis of the between group differences before treatment.

2.4 Summary of Data

Two studies were carried out in Canada (Dore et al., 1998; Medves & O’Brien, 1997), and two in Italy (Pezzati et al., 2002; Guala et al., 2003). One study was done in Australia (Bourke, 1990), and one was done in a less developed country Egypt (Shoaeib et al., 2005). Hsu et al., (2010) had their study done in Taiwan, which is a place with culture and humidity closest to Hong Kong. The sample size ranged from as small as 42 (Shoaeib et al., 2005) to as large as 1811 (Dore et al, 1998).
One of the inclusion criteria is infants with gestation age greater than 36 weeks (Hsu et al., 2010; Dore et al., 1998) or with minimum of 37 gestation weeks (Pezzati et al., 2002; Medves & O’Brien, 1997; Shoaeib et al., 2005). Two studies did not specify the gestation age (Bourke, 1990; Guala et al., 2003). A minimum Apgar score of 7 at first five minute (Guala et al., 2003; Medves & O’Brien, 1997) and minimum birth weight were set at 2500g (Hsu et al., 2010; Pezzati et al., 2002). Two studies required the mother to be an English speaker (Dore et al., 1998; Bourke, 1990), and one study only included infants born vaginally (Shoaeib et al., 2005).

Exclusion criteria include phototherapy received (Hsu et al., 2010; Pezzati et al., 2002), antibiotics treatment received (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998), NICU admission required (Pezzati et al., 2010; Dore et al., 1998; Medves & O’Brien, 1997; Bourke, 1990; Guala et al., 2003), as well as disease and umbilical catheter (Hsu et al., 2010).

One study used 95% alcohol as intervention (Hsu et al., 2010), 5 studies (Pezzati et al., 2010; Medves & O’Brien, 1997; Bourke, 1990; Guala et al., 2003; Shoaeib et al., 2005) used 70% alcohol and 1 study did not specified (Dore et al., 1998). Tap water was used in three studies as comparison (Hsu et al., 2010; Bourke, 1990; Guala et al., 2003), and two studies used sterile water (Pezzati et al., 2002).
Two studies did not specify (Dore et al., 1998; Shoaeib et al., 2005).

For usual care, daily bathing was mentioned in three studies (Hsu et al., 2010; Pezzati et al., 2002; Shoaeib et al., 2005). Hand-washing was emphasized in five studies (Hsu et al., 2010; Dore et al., 1998; Boruke, 1990; Guala et al., 2003; Shoaeib et al., 2005) while folding diaper below the umbilical cord was also suggested in four studies (Medves & O’Brien, 1997; Bourke, 1990; Guala et al., 2003; Shoaeib et al., 2005). The frequency of umbilical cord care varies from every nappy change (Hsu et al., 2010; Pezzati et al., 2002) to three times a day with inspection done at every nappy change (Dore et al., 1998; Guala et al., 2003). Dry gauze was used to cover the cord in two studies (Pezzati et al., 2002; Guala et al., 2003).

The length of follow-up ranges from 24 hours after cord separates and up to 6 weeks after birth (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998; Medves & O’Brien, 1997; Bourke, 1990; Guala et al., 2003; Shoaeib et al., 2005).

All the studies included UCST as the primary endpoint (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998; Medves & O’Brien, 1997; Bourke, 1990; Guala et al., 2003; Shoaeib et al., 2005). For secondary endpoints, omphalitis was measured in one study and 2 cases were found (Pezzati et al., 2002).
Infection was also taken into account in five studies (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998; Guala et al., 2003; Shoaeib et al., 2005). Swabs were taken to investigate the colonization among infants in five studies (Pezzati et al., 2002; Dore et al., 1998; Medves & O’Brien, 1997; Guala et al., 2003; Shoaeib et al., 2005). Normal flora, group B streptococcus and staphylococcus aureus were isolated and specified in three studies (Dore et al., 1998; Medves & O’Brien, 1997; Guala et al., 2003). Two studies did not specify the species (Pezzati et al., 2002; Shoaeib et al., 2005). Pezzati et al. (2002) included sepsis and death as one of the secondary endpoints as well.

Parental satisfaction or complaint was also taken into account in three studies (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998; Bourke, 1990). Cord bleeding and foul smell were recorded in three of the studies (Hsu et al., 2010; Pezzati et al., 2002; Bourke, 1990). Cost was only included for analysis in one study (Dore et al., 1998).

In all the studies, the UCST was significantly shorter with the effect size ranging from $p<0.001$ to $p<0.05$ (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998; Medves & O’Brien, 1997; Bourke, 1990; Guala et al., 2003; Shoaeib et al., 2005). Not all the secondary endpoints undergo a statistical analysis due to the small number of occurrence such as omphalitis where only 2 cases occurred
Colonization rate was $p<0.05$ in two studies (Pezzati et al., 2002; Shoaeib et al., 2005) while calculation was not done in the other three studies (Dore et al., 1998; Medves & O’Brien, 1997; Guala et al., 2003).

2.5 Synthesis of Data

With the integration of all seven studies (Appendix 11), we can see that dry care, such as application of water instead of alcohol contributes to a significant shorter UCST in healthy babies who weigh over 2500g and with gestation age greater than 36 weeks (Hsu et al., 2010; Pezzati et al., 2003; Dore et al., 1998; Medves & O’Brien, 1997; Bourke, 1990; Guala et al., 2003; Shoaeib et al., 2005). As there is delay in UCST in premature and immunosuppressed babies, this cord care regimen should be focused on full-term healthy babies only who are cared at home setting.

Both tap water and sterile water were used and the outcome measures in all studies were similar, and the infection rate was all zero. This shows that sterile water may not be necessary. However, in countries where clean water is a concern, such as in Asian countries where tap water is not drinkable, sterile or boiled water should be considered instead of tap water. In Hong Kong, where the humidity and water supply is close to that of Taiwan, it is acceptable to use tap water as described in the study (Hsu et al., 2010) as infection and other cord
complication was not significant. In Hong Kong, it is suggested to use cold boiled water which should be more superior than using just tap water.

The conventional practice of umbilical cord care is carried out after every nappy change. However, the frequency of diaper change varies among the newborns; for example, the number of bowel movement is greater in newborns who are breastfed than those who are formula fed. It is not practical to do it after every nappy change for breastfed newborns. As shown in the seven studies, a minimal of three times per day, with inspection at every diaper change and as needed is suggested for all newborns.

Despite the higher colonization rate in the dry care groups, the infection and omphalitis rates were not increased as a result. This implies that a higher colonization rate does not necessarily indicate infection (Dore et al., 1998). It is found that cord bleeding and foul smells are common in the course of cord separation and are not signs of infection (Hsu et al., 2010; Pezzati et al., 2003; Bourke, 1990). Infection is defined as persistent foul odor, spreading redness or edema of the skin around the umbilicus, moisture and purulent or pus-like discharge (Shoaeib et al., 2005); which also includes the need for systemic antibiotics and “scalded skin syndrome” such as acute, widespread erythematous process with epidermis peeling off (Dore et al, 1998). Evidence had shown that
parental compliance and satisfaction is higher in the dry care groups (Pezzati et al., 2002; Bourke, 1990). As health care professionals, not only it is important to reassure parents and provide reliable umbilical cord care method to sustain compliance, it is also noteworthy to let the parents understand the normal course of cord separation such as cord bleeding and foul smells, to alleviate parental anxiety.

Besides the use of an appropriate agent for umbilical cord care, other usual care is just as important. Hand-washing with soap and water is emphasized and should be reinforced by caretakers before and after cord care to minimize introduction of bacteria into the non-intact skin at the umbilical stump. It is the most important procedure to avoid cross-contamination (WHO, 1998). In addition, the diaper should be folded below the stump to allow air dry and to prevent urine and feces contamination of the cord due to delayed diaper change.

The follow-up period will be between the 4th to 6th week after birth. As newborns will return for vaccination one month after birth, the cord site is best assessed at this time. Alternatively, nurses can follow-up and check the site upon request of mothers as they return for jaundice monitoring.

Dry care has shown to be effective for umbilical cord care in seven different studies without increasing the infection rate, and it has yielded good parental
satisfaction and compliance.
Chapter 3

Implementation Potential

In 2011, 95500 live births were recorded in Hong Kong, in which 93% of them (Appendix 12) had registered at thirty-one different MCHCs located in different districts (The Financial Secretary, 2012). MCHCs provide service to newborns and children under the age of 5, as well as women under the age of 64. For child health service, it includes provision of parenting program, immunization program and health and developmental surveillance (Department of Health, 2012).

3.1 Target audience and setting

Maternal and Child Health Clinic A (MCHC A) is one of the thirty-one MCHCs under the Family Health Service of the Department of Health in Hong Kong. It provides service in one of the Kowloon districts, which has a population of 377,351, in which 13,838 of them are in the age group of 0 to 4 (Census and Statistics Department, 2012).

The target population of this evidence-based guideline will be the newborns who register at MCHC A after being discharged from any private or public hospitals. The target audience will be medical professionals working at MCHC A and parents or caretakers who bring their newborns to MCHC A.
3.2 Transferability of the findings

3.2.1 Setting

According to the literature found, the studies were carried out in nurseries at hospital setting. Then, cord care was taught and to be carried out at home setting by caretakers, where observation continued and detachment of the umbilical cord stump took place. The target setting here, indeed, is a clinic setting, where cord care is demonstrated and taught to caretakers at the first newborn visit. Yet, cord care is mainly continued at home by caretakers, similar to the reviewed studies. Therefore, the evidence is suggested to be suitable for transferal to the target setting.

3.2.2 Patient characteristics

In the reviewed studies, the newborn population was all healthy, not requiring phototherapy, antibiotics treatment, or NICU admission, and is greater than 36 weeks of gestation and each weighing more than 2500 grams at birth.

For infants attending MCHC A, they are all assessed by the pediatricians before being discharged from the hospitals. Therefore, at the time of registration at the target setting, they are likely to be healthy, free from conditions that require hospital admission or antibiotic treatment. For premature babies, the mean gestation age at hospital discharge is 36.9 weeks (Altman, Vanpee, Cnattingius &
Norman, 2009). Hence, the target population shares similar characteristics as those mentioned in the reviewed studies.

### 3.2.3 Philosophy of care

In the reviewed studies, their philosophy of care is to provide newborn care that promotes comfort and to prevent cord-related complications, as well as to reduce parental concerns.

MCHC A is under the Family Health Service of the Department of Health. The mission of the Department of Health is to safeguard the health of the community through promoting health, preventing disease and providing curative and rehabilitative services (Department of Health, 2012). As a member of the Family Health Service, MCHC A provides quality client-oriented service in health promotion and disease prevention for babies and children from birth to five years old. Anticipatory guidance on childcare and parenting are provided for parents and caregivers (Family Health Service, 2006). When the baby is first registered, cord care is one of the first essential baby care to be emphasized besides breastfeeding. Through educating parents and caretakers the correct cord care techniques and the use of an appropriate solution, the cord separation is facilitated, resulting in a decrease of cord-related complications. This, in turns, decreases parental anxiety and increases their satisfaction and confidence for the umbilical
cord care. As a result, harmony and a positive relationship between the baby and parents can be enhanced. The philosophy of care is, therefore, similar to the reviewed studies.

### 3.2.4 Number of clients

The new innovation can benefit a great proportion of clients at MCHC A. In year 2011, a total of 3334 children were registered at MCHC A, making up 3.75% of those registered at all MCHCs in Hong Kong (Appendix 12). Of the 3334 children, approximately 90% are registered at less than one month, when cord care may still be necessary.

### 3.2.5 Duration of implementation and evaluation

A memo, with the guideline attached, will be circulated among the medical staff at MCHC A for informing them the change of practice after approval from the administrators of the head office. Details of the guideline can be given in weekly meetings, and opinions will be gathered from the staff. A supplementary leaflet will be inserted into the childcare booklet that is distributed to each parent at their first visit to MCHC A. This preparation period will take four months, from proposing the change to the administrators to having all materials prepared (Appendix 16). A pilot trial will run for six months, and data collection is ongoing for those who require body weight and jaundice follow-up once the
implementation started. The information on UCST and parental and healthcare professional satisfaction is required for evaluation. If no revisit for jaundice or body weight checkup is needed, evaluation of the cord can be done by phone or at one month old according to routine, similar to most of the reviewed studies.

3.3 **Feasibility**

3.3.1 **Autonomy**

All the staff at MCHC A has the autonomy to carry out and terminate the innovation at any time when the outcome is undesirable among the target population.

3.3.2 **Interference of current staff and clients**

The implementation of the innovation can fit in smoothly with the current staff and clients at MCHC A. At each first newborn visit, the nurse responsible for weighing the baby will demonstrate the correct cord care techniques to caretakers as usual practice, but using cold boiled water instead of 70% alcohol (Appendix 13).

For detailed instructions, the nurse who interviews the caretakers can emphasize the need and frequency of cord care, as well as the normal course of cord detachment and signs and symptoms of cord infection. Parents are reminded to note the date of umbilical cord separation time. Leaflets can be
shown and discussed during the explanation (Appendix 14).

At the one month interview, nurses are required to evaluate the cord by noting down if there is any cord detachment and discharge. Parents’ opinions and concerns on the course of cord detachment will be collected as well, such as any foul smell and redness that might have increased their anxiety level, and whether the support from the nurse is enough.

3.3.3 Organization and administration support

As MCHC A is under the Family Health Service, they share the same mission. The mission is to empower clients to improve their health through providing cost-effective and evidence-based service, with continuous upgrade of service through fostering innovation to meet the changing needs of the clients (Family Health Service, 2006). Hence, the administration and organization will support such innovation, provided that it is cost-effective and cause minimal interruption to current staff functions.

Knowing the fact that the current administration and logistic in MCHC A will not be greatly disrupted and in a long run, the innovation can reduce the number of phone enquiries and revisits of newborns due to parental concerns, such as foul smell, discharge and redness, on the course of cord detachment, the staff and administrators have a fair degree of consensus that it is beneficial and worthwhile
to test the innovation.

However, implementation may encounter slight friction as explanation of detailed cord care may lengthen the interview time and the overall waiting time for clients. Support from medical officer and healthcare assistants are required to facilitate implementation. Advice on cord care provided by medical officers must be consistent to that in the leaflet and nurses’ explanation at the interview. Healthcare assistants are required to ensure cleanliness of utensils for cord care and boiling sufficient amount of water for daily use.

**3.3.4 Availability of skills and training of staff**

Cord care technique is taught at nursing school. It can be reinforced if new staff is recruited into MCHC A. Senior nursing staff will demonstrate the correct cord care technique to the new staff and return demonstration is required until satisfaction is obtained by nursing officer in-charge. According to previous experience, the trainee will become competent after one to two return demonstrations. No extra time-off from the center will be required for such training.

**3.3.5 Availability of equipment and facilities**

The required equipment will include gallipots for putting cold boiled water, cotton swabs for cleansing the cord, and a container for storing the water enough
for that day. Gallipots are readily available at MCHC A and are sent for autoclave daily after use to ensure sterilization. Cotton swabs individually packed are regularly ordered as consumables for cord care. A container with a lid may be required for storing water just for cord care use.

### 3.3.6 Evaluation

Semi-structured questionnaires will be used for evaluation. At the first newborn interview, nurses will ask caretakers to take note of the UCST and record any concerns arising from cord care. If subsequent visit is required for neonatal jaundice follow-up, data can be collected at this time. Otherwise, the above-mentioned information can be obtained at one month interview or through phone follow-up if the client does not turn up. Phone follow-up can be made by the nurse who works at the weighing station. She will also be responsible to note down the number of cord-related phone enquiries and revisit cases daily after implementation of the innovation for statistic purpose.

### 3.4 Cost and benefit Ratio

#### 3.4.1 Potential risks

The innovation will cause no risk to both the clients and the staff.

#### 3.4.2 Potential benefits

With a shorter UCST yielded from using cold boiled water for cord care,
parental anxiety is expected to decrease as said in the reviewed studies. Therefore, the number of cord-related revisits to MCHC A and phone enquiries will decrease. The workload for staff and parental stress will lessen.

3.4.3 Risks of maintaining the current practice

If the current practice is maintained, confusion may be caused among the caretakers. This is because guidance on cord care from medical professionals varies. This may lead to a breakage of the trusting relationship among parents and medical professionals. In addition, the usage of 70% alcohol can cause irritation and redness to the skin surrounding the cord stump, causing discomfort in the infants. This also prolongs UCST and increases parental concerns. As long as the cord remains attached with a wet base and discharge noted, parental concerns will never be resolved. The number of cord related phone enquiries and revisits will, as a result, increase.

3.4.4 Material cost

3.4.4a Set-up cost

MCHC A, like all the other MCHCs in Hong Kong, opens on weekdays, as well as the second and fourth Saturday of the month. Hence, the total number of child health sessions per week is six for short week and seven for long week. Taking 2013 as an example, there are 24 long weeks and 28 short weeks, and 336
child health sessions per year. The number of newborns registered per year is about 3206 and hence, the average number of newborns per session is ten (Appendix 12). About 5ml of cold boiled water is enough for each cord care demonstration. Therefore, a stainless steel container enough to put about 50ml to 100ml of water will be used and it costs about $40 each.

Leaflets with the updated cord care guidance will be given to caretakers until updated booklets are available. As the new copies of the booklets take at least three months to print, color-printed leaflets enough for at least three months will be needed. Approximately 1000 copies will cost $500 (Appendix 15).

There is no training cost as it only requires on-site demonstration by senior nursing staff, and return demonstration is immediately carried out. No time-off from duty is necessary.

3.3.4b Running cost

If this innovation is successful after pilot testing, the running cost is low as most materials are readily available such as gallipots, cotton swabs and cold boiled water. The stainless steel container can be put together with other utensils that are autoclaved daily as a routine. Hence, there is no extra cost in a long run.

Yet, if the innovation is not implemented, the amount of time spent on revisit cases and phone enquiries is expected to increase. The number of cotton swab
packets and 70% alcohol consume will also increase due to the increased number of cord reassessment whenever there is concern from the caretakers. From observation, there are two cases of cord-related enquiries and revisits per day, that means extra 10ml of 70% alcohol and two packets of cotton swabs will be needed per day.

3.4.5 Non-material cost and benefit

The nurse who interview new cases may need to spend two minutes or more each to provide more information on cord care to caretakers. Yet, this can, in a long run, save 5 to 10 minutes that may be spent for cord-related revisits and phone enquiries.

The new innovation allows a clearer guidance for caretakers on cord care. The shortened cord detachment time can relieve parental concern and hence decrease the number of cord-related revisits and phone enquiries to MCHC A. Time spent on the revisit case and phone enquiries, about 5 to 10 minutes each, can be saved for interviewing children who are back for vaccines and developmental surveillance screening. The waiting time for other clients can be shortened. With the proposed innovation, the cord-related enquires and revisits per day are expected to decrease and up to about 20 minutes is saved per nurse, which is enough to interview at least one to two more cases per nurse.
Chapter 4

Evidence-based practice guideline

Guideline title

An evidence-based guideline of using dry care approach for umbilical cord care in newborn

Intended users

All nurses and medical officers in MCHC A, who provide education on cord care to parents and caretakers.

Parents or caretakers who perform cord care to newborns

Target population

Newborn less than 1 month old

Guideline Objectives

This guideline aims to provide medical professionals in MCHC A with a unified, systematic and cost-effective evidence-based recommendations with respect to using cold boiled water for cord care in newborns. It also suggests the necessary information to be included when teaching cord care, so as to benefit the medical staff, parents and the newborns at the targeted setting.

Major outcomes considered

The primary outcome considered is the umbilical cord separation time, and the
secondary outcomes are the satisfaction of parents and healthcare professionals.

**Rating scheme for the strength of the evidence**

The SIGN Guideline Development Handbook: SIGN 50 (2008) is used to rate the evidence levels and to grade the recommendations. The ratings can give more information to the guideline users on the applicability and effectiveness of each recommendation in the guideline, allowing them to make the best choice when practicing cord care.

**Recommendations**

The recommendations will include the target audience and population that is are suitable for using the proposed innovation, the solution to be used, frequency of application, usual care, sign and symptoms of infection and length of follow-up.

1. **Targeted population**
   
   1.1 **Infants who have an gestational age of 37 weeks or older** (Pezzati et al., 2002 [1++]; Medves & O’Brien, 1997 [1+]; Shoaeib et al., 2005 [1-])

   (Grade A)

   1.2 **Infants who are healthy without any disease or any complications that require NICU admission.** (Hsu et al., 2010 [1+]; Pezzati et al., 2002 [1++]; Dore et al., 1998 [1++]; Medves & O’Brien, 1997 [ 1+]; Bourke, 1990 [1-]; Guala et al., 2003 [1-]) (Grade A)
1.3 **Infants who are not on phototherapy.** (Hsu et al., 2010 [1+]; Pezzati et al., 2002 [1++]) (Grade A)

1.4 **Infants who are not on antibiotics.** (Hsu et al., 2010 [1+]; Pezzati et al., 2002 [1++]; Dore et al., 1998 [1++]) (Grade A)

2. **Solution used for cord care**

Cold boiled water should be used for cord care.

The umbilical cord separation time is shorter when using tap water as compared to alcohol, ranging from 4.7 days to 17 days, and no case of infection was resulted. (Hsu et al., 2010 [1+]; Dore et al., 1998 [1++]; Bourke, 1990 [1-]; Guala et al., 2003 [1-]; Shoaeib et al., 2005 [1-]) (Grade A)

3. **Frequency of cord care**

Inspection of cord is carried out at every nappy change and cord care should be done three times a day or as needed. (Dore et al., 1998 [1++]; Bourke, 1990 [1-]; Guala et al., 2002 [1-]) (Grade A)

4. **Usual care**

Cord care is carried out with cotton swab and cleanse at the base. (Hsu et al., 2010 [1+]; Shoaeib et al., 2005 [1-]) (Grade A)

4.2 Diaper should be folded below the cord to keep the area dry. (Medves
& O’Brien, 1997 [1+]; Bourke, 1990 [1-]; Guala et al., 2003 [1-];
Shoaeib et al., 2005 [1-]) (Grade A)

4.3 **Hand washing must be done before cord care is performed.** (Hsu et al., 2010 [1-]; Dore et al., 1998 [1++]; Bourke, 1990 [1-]; Gaula et al., 2002 [1-]; Shoaeib et al., 2005 [1-]) (Grade A)

4.4 **The baby should be bathed daily to ensure hygiene.** (Hsu et al., 2010 [1-]; Pezzati et al., 2002 [1++]; Shoaeib et al., 2005 [1-]) (Grade A)

4.5 **Cord care should be continued for two more days after the stump detached.** (Pezzati et al., 2002 [1++]) (Grade A)

5. **Sign and symptoms of infection**

5.1 **Diagnosis of infection is based on the signs of inflammation: erythema, edema and tenderness.** (Pezzati et al., 2002 [1++]) (Grade A)

5.2 **Pustules or scaled skin syndrome, such as an acute widespread erythematous process in which the epidermis peels off, requiring systemic antibiotics, is an indication of cord infection.** (Dore et al., 1998 [1++]) (Grade A)

6. **Time of follow-up**

The time of follow-up is at 1 month. (Hsu et al., 2010 [1+]; Guala et al., 2002 [1-]) (Grade A)
Chapter 5

Implementation Plan

5.1 Communication Plan

A well-developed communication plan is essential for promoting mutual understanding with stakeholders so that the proposed innovation can be implemented smoothly at both organizational and individual level.

5.1.1 Identification of stakeholders

Identification of all stakeholders is the first step for establishing a communication plan. This is because the stakeholders are people who will be affected by the proposed innovation (Melnyk & Fineout-Overholt, 2005) and therefore, also determine whether the proposed innovation can be implemented and sustained or not. There are three levels of stakeholders involved in this proposed guideline. They are the management level, clinical level and client level.

5.1.1a Managerial level

This proposed guideline is planned to be carried out in MCHCs, which are under the Family Health Service of Department of Health. The managerial level of Department of Health at the head office is consisted of, from top-down, the Principal Medical Officer and Senior Medical Officers; for the nursing discipline,
they are Principal Nursing Officer, Chief Nursing Officer and Senior Nursing Officers. Approval must be obtained from these administrators before implementing the proposed innovation.

5.1.1b Clinical level

Besides the Medical Officer in-charge and Nursing officer in-charge, who are the key administrators of the clinic, everyone else in the clinic, such as Medical Officers, Nursing Officers, Registered Nurses (RN), Enrolled Nurses (EN), clerks, and workmen, must be alert of the proposed change. The healthcare providers are involved with cord assessment and cord care education. The clerks need to be alert of the importance of arranging follow-up appointment for cord while workmen are responsible for the preparation of utensils. Consensus and active involvement among them is needed to facilitate the pilot test and to sustain the innovation in a systematic way.

5.1.1c Client level

All caretakers will be educated to use the innovation at their first visit to MCHC. Their compliance and opinions on cord management will contribute to the improvement of the innovation.

5.1.2 Initiating the change

A 30-minute presentation will be held to all the decision-makers of Family
Health Service at the head office of Department of Health. A copy of the logistics and the proposed guideline with supporting journals attached will be distributed to them. The affirming needs and significance of the innovation will be emphasized. The potential barriers and benefits, feasibility and transferability, manpower involved, cost and benefit ratio will also be stressed as they will affect the budget and manpower allocation, which will in turn affect their decision. A two-month period is expected for any amendment and suggestion to be made from all the administrators at the head office. After the approval is gained, pilot test may be prepared and started at MCHC A.

To initiate the proposed change at MCHC A, a small committee will be set up, which includes one Medical Officer, one Nursing officer, a RN with public health qualification and a more junior RN, who is usually assigned to the cord care demonstration. This committee will report to the Medical Officer in-charge and Nursing Officer in-charge. The long-term beneficial effects such as the decrease in workload and enquiries on cord care will be pin-pointed.

5.1.3 Sustaining the change

A flowchart of the logistics will be posted on each interview room and a manual with the guideline with rationales and logistic flowcharts will be printed for each staff. Any cord-related difficulties or events encountered are open for
discussion at the weekly clinical meeting and may be used for refinement of the
guideline or logistics if feasible. A questionnaire will be designed and inserted
into the progress notes by clerks at registration to remind nurses to ask about the
cord event at the first visit and the one-month interview. Proper cord care will
be put into the training logbook for all the new staff. Monthly statistics of the
cord-related events will be generated so as to gain more support and incentive to
sustain the change.

5.2 Pilot Test

Pilot testing is a small-scale trial run that can offer insights into the feasibility
of implementing the intervention at a large-scale real world setting (Polit & Beck,
2008). Hence, it is an essential preliminary step to be taken before
implementation of the guideline across all regional MCHCs.

The pilot test is expected to take place at MCHC A around the end of the year
when the birth rate is relatively higher so we can obtain a larger sample size
(Census & Statistic Department, 2012). The pilot test will run for six months,
from November to April. There will be about 168 child health sessions within
this period and with about 10 newborn registrations per day (Appendix 12), a
sample size of 1680 subjects are expected within this period.
5.2.1 Objectives

1) To test the feasibility and effectiveness of the proposed guideline

2) To assess the satisfaction of caretakers and healthcare professionals

3) To detect any unanticipated difficulties or potential problems that may be encountered

4) To evaluate the proposed guideline

5) To make timely revision and modifications before wide dissemination of the proposed guideline

5.2.2 Introduction of innovation

A briefing session will be held by the committee set up earlier at the weekly clinic meeting of MCHC A to introduce the proposed innovation. At MCHC A, there is one Medical Officer in-charge, one Medical Officer, one Nursing Officer in-charge, two Nursing Officers, 13 RN in which three of them have public health qualification, and one Enrolled Nurse. The logistic will be explained to all the staff. Being the key health educators at MCHCs, rationales of the practice must be understood by all healthcare professionals to achieve consistency in the message delivered to the public. A two-week period will be given to all the staff for familiarization of the new plan. Meanwhile, feedback on logistics can be raised to the committee. A summary will be further reported to the Medical
Officer in-charge and Nursing Officer in-charge. Refinement on the logistics and task allocation is expected to take two weeks (Appendix 16).

5.2.3 Training and stocking required materials

When the amendment is done and the printed materials are finalized and sent for printing, training and the purchase of the required equipment from the Central Store Unit, such as the stainless steel container can be carried out by the committee. The proposer from the committee will demonstrate proper cord care to all the staff to ensure consistent practice. Return demonstration by each staff member would be done to ensure standardization. This will take about two hours in any one of the non-infant sessions. A questionnaire will be given to the clerk to put in the progress note at the clients’ first and one-month visit to remind the nursing staff to educate the caretakers on cord care and ask them about the course of cord detachment at interviews. Several copies of questionnaires will be put at each interview desks for ad hoc assessment when the baby is returned for jaundice or body weight follow-up before 1 month. This means, assessment can be done at any subsequent visits and by one-month interview.

A staff manual with the guideline, and updated logistics and pamphlets for caretakers enough for the trial run will be printed by the Central Health Education Unit and sent to MCHC A.
The whole clinical preparation process shall be done within two months and the pilot study can commence as soon as the printed materials are ready (Appendix 16).

5.2.4 Logistics

Once the pilot test commence, all caretakers attending MCHC A the first time will be educated on proper cord care through demonstration by the nurse at the body weight station and rationales behind will be explained during interview to enhance compliance, unless the cord has already detached and cord base is dry (Appendix 13). At interviews, nurses will introduce the support that is offered to caretakers and explain the rationales and the course of cord detachment with the aid of a pamphlet. Caretakers are reminded to note down the date of cord detachment. They are also invited to give feedback at subsequent interview.

Workmen are reminded to prepare enough cold boiled water daily. RN responsible for body weight station is required to ensure the stainless steel container is properly autoclaved. At any subsequent visit or by one-month interview, the key outcome, such as the umbilical cord separation time (UCST), and opinions from parents will be collected. At 6 months after the pilot study started, opinions from healthcare professionals will be explored. Any parents who opt for private vaccines will be followed up by phone.
Chapter 6

Evaluation Plan

An evaluation plan is a systematic step to assess whether the objectives have achieved, such as how effective and efficient the implementation is and whether the proposed guideline is feasible and acceptable by the users. The following steps will be discussed: process and outcome evaluation, criteria of effectiveness, sample characteristics and size, data collection and data analysis.

6.1 Process evaluation

As Registered Nurses and Medical Officers are actively involved in cord care education and assessment, their opinions are important for improving and implementing the innovation in the other regions.

A semi-structure questionnaire (Appendix 17) will be given to healthcare providers in MCHC A six months after the commencement of the pilot test. They are encouraged to express freely on the innovation, and their opinions will be categorized into several areas, such as their acceptability of the logistics and innovation, compliance to the innovation, their confidence and competence in carrying out cord care demonstration and explanation rationales to caretakers.

In addition, another semi-structured questionnaire (Appendix 18) will be given to caretakers. Their difficulties and concerns regarding cord care will be
explored.

Skin irritation and any adverse events will also be looked into in both questionnaires.

6.2 Outcome evaluation

The primary outcome in this implementation is the umbilical cord separation time (UCST). It will be measured through self-report by parents at nursing interviews. The specific day, and ideally the time, will be acknowledged and recorded down by the nurse.

With reference to the reviewed literatures (Hsu et al., 2010; Pezzati et al., 2002; Dore et al., 1998; Medves et al., 1997; Bourke, 1990; Guala et al., 2003 & Shoaelb et al., 2005), the mean UCST when using water for cord care is 7 days to 10 days. If the mean UCST from the pilot study falls in or less than this range, the implementation is considered effective.

6.3 Sample characteristics

Eligibility will be listed clearly in the staff manual and screened by the interviewed nurse at first visit. The sample must be equal or greater than 37 weeks of gestation, has never been admitted Neonatal Intensive Care Unit, nor receive any phototherapy and not on antibiotics. In addition, the cord must be still on at the first visit. A red-dot will be marked at the upper right corner of the
cover if the baby is eligible, hence follow-up actions will be done.

6.4 Sample size

The sample size will be determined by the availability of new registration at MCHC A, which varies according to the birth rate in the district where it is located. According to the estimation mentioned in Chapter 3, the number of new cases requiring cord care is 280 per month. Therefore, the available sample size after 6 months is more or less about 1680, such as n=1680 (Appendix 12).

6.5 Data collection

The following data is collected routinely at the first visit:

1. Mother’s name
2. Date and time of birth
3. Place of birth
4. Gender
5. Mode of delivery
6. Education level of caregiver

At any subsequent jaundice or body weight follow-ups, or at one month interview, or at phone follow-up, additional information will be gathered (Appendix 17).

7. Solution used for cord care
8. Frequency of cord care
9. **Date and time of umbilical cord detachment**

Questionnaires with the above questions (#7, 8, 9) will be given to parents at the day of cord assessment, which must be carried out by one month after delivery.

In addition, a set of questionnaires is also designed for healthcare professionals, which is to be filled out after 6 months since the pilot test commenced.

**6.6 Data Analysis**

Information gathered from semi-structured questionnaires will be analyzed using transcription. The proposer of the guideline from the committee will partner with a researcher to develop a descriptive and concrete category system such as if training was adequate or not, the guideline caused an increase or decrease in workload, common cord-related adverse events encountered and more. Everyone from the committee will be responsible to help screening the collected questionnaires and code the answers into corresponding categories.

The data collected and analyzed, along with the opinions from caretakers and staff, and a thorough report of the entire pilot test, will be submitted to the headquarter of Family Health Service for administrators to approve whether such innovation can be disseminated to other MCHCs in Hong Kong.
Chapter 7

Conclusion

As stated in the mission and core values of the Department of Health, the Maternal and Child Health Centers are responsible to provide ongoing professional community support to parents regarding child care. Therefore, continuous improvement and standardization is important. Partnership with parents is built up at the first visit to the Maternal and Child Health Centers. Cord care is emphasized as it is one of the most important newborn care items to be taught. However, many parents find this procedure difficult and show reluctance and avoidance in performing it. Their level of anxiety does not decrease until the cord has detached. In addition, the difference in cord care practice and the solution used caused confusion among healthcare professionals and parents. As studied in literature, the solution used for cord care is proven to affect the UCST. It is also suggested that shortened UCST can decrease parental anxiety. Hence, dry care is proposed as it is effective in reducing the UCST as studied in literature.

After reviewing the evidence from the literature regarding umbilical cord care, recommendations concerning the target population, solution to be used, frequency of cord care, daily care, time of follow-up and signs and symptoms of
infection were drawn and used to develop an evidence-based guideline on dry care.

The implementation of the proposed innovation does not only facilitate cord detachment, but also provides standardization cord care practice among Maternal and Child Health Centers. Furthermore, parents who are empowered with the proper cord care skills will become more confident in performing such procedure. The workload of healthcare professionals in handling cord-related concerns can then be reduced.

The transferability of the proposed innovation into the Maternal and Child Health Center is high as the characteristics of the target population and the philosophy of care is similar to the reviewed studies. After considering the availability of the required skills and resources, the acceptability of the administrators and frontline staff, the cost and benefits ratio, it is feasible to run this innovation.

A committee will be set up and provide full support whenever problems or questions arise at any stage of the implementation. It will ensure that the implementation process is proceeding according to the timeline, through arranging training sessions, obtaining the required materials to run the pilot test and the like.

The pilot trial is expected to run for 6 months and data collection will be
ongoing within those 6 months. Evaluation includes process and outcome evaluation using semi-structured questionnaires for assessing whether the objectives are achieved and whether the innovation is effective.

It is hoped that the proposed dry care intervention is beneficial to the target population, such that the umbilical cord separation time is shortened and parental anxiety is alleviated, and this will further reduce the workload of the healthcare professionals.
References


& healthcare: A guide to best practice. Philadelphia: Lippincott Williams & Wilkins


Pezzati, M., Biagioli, E.C., Martelli, E., Gambi, B., Biagiotti, R., & Rubaltelli, F.


World Health Organization. Care of the umbilical cord. *WHO/FHE/MSM-cord*


*Cochrane database Syst. Rev* 2004, 3(3):CD001057
APPENDICES
Appendix 1

A study done by a Maternal and Child Health Center in 2009

<table>
<thead>
<tr>
<th></th>
<th>HA</th>
<th>GP</th>
<th>Total</th>
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<tbody>
<tr>
<td><strong>Water</strong></td>
<td>82 (97.6%)</td>
<td>2 (6.9%)</td>
<td>84 (74.3%)</td>
</tr>
<tr>
<td><strong>Alcohol</strong></td>
<td>2 (2.4%)</td>
<td>27 (93.1%)</td>
<td>29 (25.7%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>84</td>
<td>29</td>
<td>777</td>
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<table>
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<tr>
<th>Method of cord care</th>
<th>Days of cord separation</th>
<th>&lt; 7 days</th>
<th>7 – 20 days</th>
<th>&gt; 20 days</th>
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<tr>
<td>Cold boiled water</td>
<td></td>
<td>55 (65.5%)</td>
<td>29 (34.5%)</td>
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</tr>
<tr>
<td>Alcohol (70-75%)</td>
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<td>0</td>
<td>20 (68.9%)</td>
<td>9 (31.1%)</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td>55</td>
<td>49</td>
<td>9</td>
<td>113</td>
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</table>

*HA = Hospital Authority*

*GP = General practitioners from private hospitals*
### Appendix 2

**Search History:**

<table>
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<td>(S1) Umbilical cord</td>
<td>33092</td>
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<tr>
<td>(S2) Umbilical cord care</td>
<td>1513</td>
</tr>
<tr>
<td>(S3) S2 AND randomized controlled trials</td>
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<td>(S3) AND English</td>
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## Appendix 3


<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Patient characteristics</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Length of follow-up</th>
<th>Outcome measures</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| Hsu et al., (2010)| Prospective randomized controlled trial (Level II) | • Full term >36 weeks  
• Birth weight >2500g  
• No phototherapy  
• Never been treated with antibiotics  
• No umbilical catheters  
• Not diagnose of any disease before discharge | 95% alcohol after bathing (n = 75)  
| Tap water + dry with cotton swab (n = 75) | 1 month | **Primary**  
1. Umbilical cord separation time (days)  
2. Omphalitis  
3. Skin infection  
4. Complaint of discharge  
5. Complaint of foul smell | 1) Alcohol 10.6 (2.5)  
Tap water 11.7 (3.4)  
p<0.05  
2) No omphalitis  
3) No skin infection  
4) Alcohol 9 cases  
Tap water 5 cases  
p<0.63  
5) No complaint on foul smell |
## Appendix 4


<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Patient characteristics</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Length of follow-up</th>
<th>Outcome measures</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pezzati, M. et al., (2002)</td>
<td>Prospective randomized controlled trial (Level II)</td>
<td>Full-term &gt;37 weeks</td>
<td>- 70% alcohol (n = 178)</td>
<td>Sterile water (n = 177)</td>
<td>6 weeks</td>
<td><strong>Primary</strong>&lt;br&gt;1. Umbilical cord separation time&lt;br&gt;<strong>Secondary</strong>&lt;br&gt;2. Infection&lt;br&gt;3. Sepsis&lt;br&gt;4. Death&lt;br&gt;5. Omphalitis&lt;br&gt;6. Colonization&lt;sup&gt;2&lt;/sup&gt;&lt;br&gt;7. Compliance&lt;br&gt;8. Cord bleeding&lt;br&gt;9. Parent satisfaction</td>
<td>1. Alcohol 16.9 ± 7.5 vs. sterile water 7.5 ± 3.1 days <em>p</em>&lt;0.05&lt;br&gt;2. Nil&lt;br&gt;3. Nil&lt;br&gt;4. Nil&lt;br&gt;5. 2 cases in both groups&lt;br&gt;6. Alcohol 52.3% vs. sterile water 71.2% <em>p</em>&lt;0.05&lt;br&gt;7. Alcohol 70.8% vs. sterile water 80.2% <em>p</em>&lt;0.05&lt;br&gt;8. Alcohol 4.1% vs. sterile water 10.6% <em>p</em>&lt;0.05&lt;br&gt;9. Alcohol 42.7% vs. sterile water 78% <em>p</em>&lt;0.05</td>
</tr>
</tbody>
</table>

1: not analysis done due to the small number of cases; omphalitis: erythema, edema, tenderness; 2: colonization: Staphylococcus aureus, streptococcus group B, Escherichia coli 3: NICU: Neonatal Intensive Care Unit
### Appendix 5


<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Patient characteristics</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Length of follow-up</th>
<th>Outcome measures</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| Dore et al., (1998)| Prospective randomized controlled trial (Level II)| - Full term > 36 weeks  
- Not receiving systemic antibiotics  
- Spent no time in the NICU\(^4\)  
- Mother spoke and read English  
- Has a telephone  
- Less than 8 hours of age at randomization| Alcohol (n = 902)  
- Inspection at every diaper change  
- Cord treatment applied 3 times /day  
- Hand-washing  
- Usual instruction on newborn care, cord observation  
- Follow-up appointment with health care provider| Plain water (n = 909) | 2 – 3 weeks | 1. Umbilical cord separation time (days)  
2. Infection\(^1\)  
3. Colonization\(^2\)  
4. Maternal anxiety  
5. Cost | 1. Alcohol 9.8 ± 4.6 vs. Plain water 8.16 ± 3.1 \(p<0.001\)  
2. Nil  
3. Alcohol vs. plain water:  
\textbf{GBS:}  
14.3\% vs 12\%  
\textbf{Normal flora:}  
28.5\% vs. 32\%  
\textbf{S. Aureus:}  
43\% vs. 36\%  
4. Alcohol 3.88 vs. plain water 3.87\(^3\) (not significant)  
5. Alcohol > dry care; USD$1.28 per vaginal birth |

\(^1\): Infection: based on criteria of hospital readmission for omphalitis, need for systemic antibiotics related to cord, pustules around cord site, “scalded skin syndrome”: acute, widespread erythematous process, epidermis peels off;  
\(^2\): 32 swabs taken, GBS = Group B Streptococcus, S. aureus = staphylococcus aureus  
\(^3\): 1 very anxious, 5 very relieved  
\(^4\): Neonatal Intensive Care Unit
Appendix 6


<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Patient characteristics</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Length of follow-up</th>
<th>Outcome measures</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| Medves et al., (1997) | Prospective randomized controlled trial (Level II) | • Within three hours of birth  
• With Apgar score at least 7 at 5 minutes  
• At least 37 gestation week  
• Did not admit to the NICU\(^2\) | Isopropyl alcohol pad (n = 71) | Sterile water (n = 65) | 24 hours after cord separation | 1. Umbilical cord separation time (days)  
2. Skin colonization\(^1\) | 1. Alcohol pads  
13.1 ± 5.7 vs. sterile water  
P<0.002  
2. Alcohol pads 44% vs. sterile water 47% (not significant) |

1: Mixed skin flora, diptheroids, coliforms (more prevalent in sterile water group), coagulase negative staphyloccoci (CNS) more prevalent in alcohol group.  
2: Neonatal Intensive Care Unit
### Appendix 7


<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Patient characteristics</th>
<th>Interventions</th>
<th>Comparison</th>
<th>Length of follow-up</th>
<th>Outcome measures</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| Bourke E., (1990) Quasi-experimental (Level III) | | ● Nursed in post-natal ward  
● Did not stay in NICU<sup>1</sup>  
● Speak and understand English | 70% Alcohol  
(n = 48)  
- Every nappy change  
- Cord ties applied and changed daily until discharge | Tap water  
(n = 55)  
- After bathing  
- When skin/cord junction is soiled (urine / stool)  
- No cord ties | Day 21 | 1. Umbilical cord separation time (days)  
2. Clean and dry, slight moist with or without small amount of blood  
3. Discharge and/or foul smell; periumbilical skin red and inflamed |  
1. Alcohol 2 – 10 (mean 6.4) vs. tap water 2 – 17 (mean 8.04)  
P<0.001  
2. Alcohol 89.6% vs. tap water 94% (p<0.4)  
3. Alcohol 10.4% vs. tap water 5.5% (p<0.4) |

<sup>1</sup>: Neonatal Intensive Care Unit
**Appendix 8**


<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Patient characteristics</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Length of follow-up</th>
<th>Outcome measures</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guala et al.,</td>
<td>Quasi-experimental (Level III)</td>
<td>Birth weight &gt;2500g, Apgar score &gt;7 at 5 minutes, Healthy, Admitted to the nursery, Not admitted to the NICU nor surgical unit</td>
<td>- 70% alcohol + gauze dressing (n = 50)</td>
<td>- warm water + dry gauze dressing (n = 100)</td>
<td>1 month</td>
<td>1. Umbilical cord separation time (days)</td>
<td>1. Alcohol 14 ± 6 vs. water 12 ±5 (p&lt;0.01)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. Colonization</td>
<td>3. Majority = normal flora</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alcohol vs. water: GBS (7 vs. 2 swabs), S.Aureus (1 vs. 2 swabs)</td>
<td></td>
</tr>
</tbody>
</table>

1: 10% of each infant group. GBS: Group B Streptococcus; S. Aureus: Staphylococcus Aureus
### Appendix 9


<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Patient characteristics</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Length of follow-up</th>
<th>Outcome measures</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| Shoaelb et al., (2005) | Quasi-experimental (Level III) | ● NSD  
● Full-term  
● Healthy  
● Using one of the proposed studied methods of cord care | - 70% Alcohol (n = 25) | - Plain water, (n = 17) | Until cord separates | **Primary**  
1. Umbilical cord separation time (days)  
2. Infection¹  
3. Increase in bacterial colonization from day 0 to 3rd day of birth | 1. Alcohol 6.4 ± 2.4 vs. plain water 4.7 ± 1.9 (p<0.05)  
2. Alcohol 26.3% vs. plain water 0% (p<0.05)  
3. Alcohol 44% vs. plain water 35.3% (p<0.05) |

**¹**: Infection: persistent foul odor, spreading redness or edema of the skin around the umbilicus, moisture, purulent or pus-like discharge
### Appendix 10 – Quality Assessment

<table>
<thead>
<tr>
<th></th>
<th>Hsu et al., 2010</th>
<th>Pezzati et al., 2002</th>
<th>Dore et al., 1998</th>
<th>Medves &amp; O’Brien, 1997</th>
<th>Bourke, 1990</th>
<th>Guala et al., 2002</th>
<th>Shoaeib et al., 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section 1: Internal validity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>The study addresses an appropriate and clearly focused question.</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Adequately addressed</td>
</tr>
<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomized.</td>
<td>Poorly addressed</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Adequately addressed</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>1.3</td>
<td>An adequate concealment method is used.</td>
<td>Not addressed</td>
<td>Adequately addressed</td>
<td>Well covered</td>
<td>Not addressed</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>1.4</td>
<td>Subjects and investigators are kept “blind” about treatment allocation.</td>
<td>Not addressed</td>
<td>Adequately addressed</td>
<td>Well covered</td>
<td>Adequately addressed</td>
<td>Adequately addressed</td>
<td>Not addressed</td>
</tr>
<tr>
<td>1.5</td>
<td>The treatment and control groups are similar at the start of the trial.</td>
<td>Well covered</td>
<td>Adequately addressed</td>
<td>Adequately addressed</td>
<td>Adequately addressed</td>
<td>Not addressed</td>
<td>Adequately addressed</td>
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<tr>
<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Poorly addressed</td>
<td>Poorly addressed</td>
</tr>
<tr>
<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Well covered</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------------------------------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>--------------</td>
<td>--------------</td>
<td>--------------</td>
<td>--------------</td>
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<tr>
<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
<td>5.3%</td>
<td>0%</td>
<td>3.46%</td>
<td>8.1%</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>1.9</td>
<td>All the subjects are analyzed in the groups to which they were randomly allocated (often referred to as intention to treat analysis)</td>
<td>Not reported</td>
<td>Not applicable</td>
<td>Well covered</td>
<td>Well covered</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites.</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Well covered</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

**Section 2: Overall assessment of the study**

| 2.1 | How well was the study done to minimize bias? Code ++, +, or – | + | ++ | ++ | + | - | - | - |
Taking into account clinical considerations, your evaluations of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?

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<th>YES</th>
<th>YES</th>
<th>YES</th>
<th>YES</th>
<th>NO</th>
<th>NO</th>
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Are the results of this study directly applicable to the patient group targeted by this guideline?

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<tr>
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### Appendix II – Summary of data

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<th>Characteristics</th>
<th>Sample size</th>
<th>Exclusion criteria</th>
<th>Randomization</th>
<th>Blinding</th>
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<tbody>
<tr>
<td>Hsu et al., 2010</td>
<td>&gt;36wk; &gt;2500g</td>
<td>150</td>
<td>-No phototherapy, -No antibiotics Tx; -No umbilical catheters; -No disease</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Pezzati et al., 2002</td>
<td>&gt;37wk; &gt;2500g</td>
<td>355</td>
<td>-No phototherapy; -No antibiotics Tx; -No complications requiring NICU admission</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Dore et al., 1998</td>
<td>&gt;36wk</td>
<td>1811</td>
<td>-No antibiotics Tx; -No NICU admission</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Medves &amp; O’Brien, 1997</td>
<td>&gt;37wk; AS &gt;(7^5)</td>
<td>136</td>
<td>Nurse in PN ward</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Bourke, 1990</td>
<td></td>
<td>103</td>
<td>-No NICU admission</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Guala et al., 2003</td>
<td></td>
<td>150</td>
<td>-No NICU admission nor surgical unit</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Shoaeib et al., 2005</td>
<td>&gt;2500g; AS &gt;(7^5)</td>
<td>42</td>
<td>FT, NSD</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

- Place of Rx: Taiwan, Italy, Canada, Australia, Italy, Egypt
- Characteristics: >36wk; >2500g, >37wk; >2500g, >36wk, >37wk; AS >\(7^5\)
- Sample size: 150, 355, 1811, 136, 103, 150, 42
- Exclusion criteria: -No phototherapy, -No antibiotics Tx; -No umbilical catheters; -No disease, -No phototherapy, -No antibiotics Tx; -No umbilical catheters; -No disease, -No antibiotics Tx; -No complications requiring NICU admission, Nurse in PN ward, -No NICU admission, -No NICU admission, -No NICU admission nor surgical unit, FT, NSD
- Randomization: Yes, Yes, Yes, Yes, No, No, No
- Blinding: Yes, Yes, Yes, Yes, No, No, No
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<tr>
<th>Intervention</th>
<th>95% alcohol</th>
<th>70% alcohol</th>
<th>Alcohol</th>
<th>Isopropyl alcohol</th>
<th>70% alcohol</th>
<th>70% alcohol</th>
<th>70% alcohol</th>
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<tr>
<td><strong>Comparison</strong></td>
<td>Tap water</td>
<td>Sterile water</td>
<td>Plain water</td>
<td>Sterile water</td>
<td>Tap water</td>
<td>Tap water</td>
<td>Plain water</td>
</tr>
<tr>
<td><strong>Usual care</strong></td>
<td>-Daily bathing; -Dry with cotton swab -Every nappy change -Hand-washing</td>
<td>-Daily bathing -Every nappy change -Cover with dry gauze -Continue x 2 more days</td>
<td>-Inspection every change -Apply 3x/day -Handwashing</td>
<td>-Diaper below cord</td>
<td>-As needed -Hand-washing -Diaper below cord -Cord clamp removed at 24 hrs</td>
<td>-Inspect every change -Apply 3x per day -Hand-washing; diaper below cord; -Covered with gauze dressing</td>
<td></td>
</tr>
<tr>
<td><strong>Length of FU</strong></td>
<td>1 month</td>
<td>6 weeks</td>
<td>2-3 weeks</td>
<td>24 hours</td>
<td>21 days</td>
<td>1 month</td>
<td>Cord separate</td>
</tr>
<tr>
<td>UCST (days)</td>
<td>10.6 ± 2.5</td>
<td>16.9 ± 7.5</td>
<td>9.8 ± 4.6</td>
<td>13.1 ± 5.7</td>
<td>2-17 (mean 8.04)</td>
<td>14 ± 6</td>
<td>6.4 ± 2.4</td>
</tr>
<tr>
<td>(Int. vs control)</td>
<td>11.7 ± 3.4</td>
<td>7.5 ± 3.1</td>
<td>8.16 ± 3.1</td>
<td>10.5 ± 3.7</td>
<td>2-10 (mean 6.4)</td>
<td>12 ± 5</td>
<td>4.7 ± 1.9</td>
</tr>
<tr>
<td>Omphalitis</td>
<td>Nil</td>
<td>2 in each group</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Infection</td>
<td>Nil</td>
<td>nil</td>
<td>Nil</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>26.3% vs. 0%</td>
</tr>
<tr>
<td>Colonization (Int. vs. control)</td>
<td>NA</td>
<td>52.3% vs. 71.2%</td>
<td>GBS 14.3% vs 12%; NF 28.5% vs 32%; SA 43% vs 36% (ns)</td>
<td>44% vs. 47% (ns)</td>
<td>NA</td>
<td>GBS 7 vs 2 swabs; SA 1 vs 2 swabs; NF (majority) (ns)</td>
<td>44% vs. 35.3%</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----</td>
<td>----------------</td>
<td>---------------------------------</td>
<td>-----------------</td>
<td>----</td>
<td>---------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Parental satisfaction</td>
<td>Nil complaint</td>
<td>42.7% vs. 78% (anxiety) 3.88 vs 3.87 (ns)</td>
<td>NA</td>
<td>Less complaint in control group (ns)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Compliance</td>
<td>NA</td>
<td>70.8% vs. 80.2%</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Cord bleeding / Foul smell</td>
<td>NA / 9 vs. 5 complaints</td>
<td>4.2% vs. 10.6%</td>
<td>NA</td>
<td>NA</td>
<td>94% vs. 89.6% 5.5% vs 10.4%</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
Appendix 12

Average number of newborn per session at MCHC A

- Number of live births in Hong Kong in 2011 = 95500
- Number of children registered at all 31 MCHCs in Hong Kong in 2011
  = 93% x 95500
  = 88815

Service timetable at MCHC A

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>9am</td>
<td>Child Health</td>
<td>Child Health</td>
<td>Child Health</td>
<td>Child Health</td>
<td>Child Health</td>
<td>Child Health (9am-12noon)</td>
</tr>
<tr>
<td>1pm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2pm</td>
<td>Child Health</td>
<td>Child Health</td>
<td>Child Health</td>
<td>Child Health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5pm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Number of long week in 2013 = 24
- Number of short week in 2013 = 28
- Number of child health sessions per year = (24 x 7) + (28 x 6) = 336

- Average number of newborn (less than 1-month-old) registration per year
  \[ \frac{(number \ of \ registration \ in \ 2011 \ + \ number \ of \ registration \ in \ 2012) \times 90\%}{2} \]
  \[ = \frac{(3334 + 3790) \times 0.9}{2} \]
  \[ = 3206 \]

- Average number of newborn (less than 1-month-old) registration per session
  \[ = \frac{3206}{336} \]
  \[ = 9.5 \]
  \[ = 10 \]
Appendix 13

Logistics at MCHC A at first visit (for internal use)

1. Normal course of detachment
2. Frequency of cord care
3. Signs and symptoms of infection
4. Note the date of cord detachment
5. To return to MCHC or call for enquiry if there is any concerns regarding cord care
6. Introduction of online video demonstration

Address:

1. Normal course of detachment
2. Frequency of cord care
3. Signs and symptoms of infection
4. Note the date of cord detachment
5. To return to MCHC or call for enquiry if there is any concerns regarding cord care
6. Introduction of online video demonstration

Diagram:

- Body weight checking
- Umbilical cord on?
  - YES
  - Cord care technique demonstration
  - NO
  - Base wet?
    - YES
    - No action
    - NO

1. Pour about 5ml of cold boiled water into a sterile gallipot
2. Hand-washing***
3. Open 1 pack of cotton wool swabs (or more PRN)
4. Dip all the clean cotton wool swabs into the water
5. One swab once***
6. Ensure the base of the cord is cleansed***
7. Note signs and symptoms of infections***
Appendix 14

Sample of the leaflet

Umbilical cord care in newborns

1. Preparation before cord care
   
   1.1 Hand-washing with soap (please follow the seven steps of hand-washing)
   
   1.2 5ml of cold boiled water put into a clean receptor
   
   1.3 At least 5 sticks of cotton wool swabs

2. Frequency of cord care
   
   2.1 Three times a day (after bathing and after changing diaper)
   
   2.2 As necessary when discharge is noted
   
   2.3 Inspection at every diaper change

3. Cleansing technique
   
   3.1 Make sure the base of the stump is cleansed (where the stump connects with the skin)
   
   3.2 One swab once until it is clean without discharge
   
   3.3 Be gentle to avoid bleeding
4. The course of detachment may take 5 to 10 days, or up to 3 weeks or more.

Any signs of infection such as: Edema, erythema around cord site, peeling of skin and tenderness, please return to your registered MCHC as soon as possible.
## Appendix 15

### Cost and Expenditure table

**Materials needed:**

**Expenditures:**

<table>
<thead>
<tr>
<th>Items</th>
<th>Calculation</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel container</td>
<td>$40</td>
<td>$40</td>
</tr>
<tr>
<td>Photocopy fees</td>
<td>Minimum number of copies*</td>
<td>$500</td>
</tr>
<tr>
<td></td>
<td>= 1000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Color-printed leaflet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= $0.5 each</td>
<td></td>
</tr>
<tr>
<td>Training</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total set up cost</td>
<td></td>
<td>$540</td>
</tr>
</tbody>
</table>

*Number of child health sessions in three months
= (10 x 7 x 6) + (10 x 6 x 6)
= 780
= minimum number of leaflet copies
Benefit (Cost saving)

<table>
<thead>
<tr>
<th>Item</th>
<th>Calculation</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>70% alcohol (500ml)</td>
<td>$15.3 x 4 x 12</td>
<td>$734.4</td>
</tr>
<tr>
<td>Extra packets of cotton swab</td>
<td>$0.41 x 2 x 28 x 12</td>
<td>$275.52</td>
</tr>
<tr>
<td>Total cost if innovation not implemented</td>
<td></td>
<td>$1009.92</td>
</tr>
<tr>
<td>(to the nearest dollar)</td>
<td></td>
<td>= $1010</td>
</tr>
</tbody>
</table>

^Extra cases per day if innovation not implemented = 2
^Extra cases per month if innovation not implemented = 56

^Cost of 1 pack of cotton swabs = $820 / 2000 packs
   = $0.41 per pack

**Average number of child health sessions per month
   = total number of child health sessions / 12 months
   = 336/12
   = 28

*Average number of cord care needed to be done per month
   = 28 x average 10 cases per day
   = 280

*Average milliliters of alcohol needed = (280 +56) x 5 = 1680
   ➢ Number of bottles 500ml 70% alcohol needed per month
   ➢ = 1680 / 5
   ➢ = 3.36
   ➢ = 4

Cost to benefit ratio

\[
\text{Cost to benefit ratio} = \frac{\$1010}{\$540} = 1.87
\]

The innovation is cost-effective.
# Appendix 16 - Innovation Planning Timeline

<table>
<thead>
<tr>
<th>Months</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November - April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
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</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

- **Preparation of presentation**
- **Presentation to administrators + approval period**
- **Briefing staff at MCHC + setup of committee + familiarization + feedback**
- **Refinement of logistics**
- **Printing of pamphlets and staff manual**
- **Material preparation**
- **Training**
- **Pilot test**
- **Evaluation**
### Appendix 17

**Questionnaires for staff**

Please give opinions, such as difficulties encountered or any concerns you would like to express, in the following aspects:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Training</td>
</tr>
<tr>
<td>2</td>
<td>Staff manual</td>
</tr>
<tr>
<td>3</td>
<td>Logistic</td>
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<td>4</td>
<td>Workload</td>
</tr>
<tr>
<td>5</td>
<td>Cord assessment</td>
</tr>
<tr>
<td>6</td>
<td>Cord demonstration</td>
</tr>
<tr>
<td>7</td>
<td>Explanation at interview</td>
</tr>
<tr>
<td>8</td>
<td>Confidence in carrying out the innovation</td>
</tr>
<tr>
<td>9</td>
<td>Competence</td>
</tr>
<tr>
<td>10</td>
<td>FAQ from caretakers</td>
</tr>
<tr>
<td>11</td>
<td>Adverse events noted at cord assessment</td>
</tr>
<tr>
<td>12</td>
<td>Overall satisfaction</td>
</tr>
</tbody>
</table>

Other comments and recommendations

_________________________________________________________
### Appendix 18

**Questionnaires for Caretakers**

| 1) Which day did the cord come off? |  |
| 2) What solution did you use for cord care? |  |
| 3) How many times did you perform cord care? |  |

Please give opinions, such as difficulties encountered or any concerns you would like to express, in the following aspects:

| 4) Nurses’ explanation at interview |  |
| 5) Cord care demonstration |  |
| 6) Pamphlet information |  |
| 7) Anxiety level during cord care |  |
| 8) Any undesirable events? (foul smell? Redness?) |  |
| 9) Your utmost concern in cord care |  |

Other comments and recommendations

___________________________________________________________________________