Abstract of thesis entitled

An evidence-based guideline on emollient therapy for skin care in premature infants

Submitted by

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Skin is the major protective barrier in a human body. In premature infants, the immature skin barrier reduces the protection against germs. Emollient therapy is an effective prophylactic measure to improve premature infants’ skin condition so as to protect the premature infants against infection. A systematic review of studies shows that emollient therapy is a simple, safe and cost effective intervention for premature infants to improve skin condition. Evidence shows that emollient therapy can also decrease transdermal water loss, conserve heat and energy, stabilize fluid and electrolytes and prevent nosocomial sepsis. The potential of implementing the proposed evidence-based guideline is explored. It will be carried out in a clinical setting. The transferability of the findings, feasibility and cost-benefit ratio of the emollient therapy will be discussed. In order to ensure the evidence-based guideline will be carried out smoothly, a
communication plan is necessary to be made in consultation with the stakeholders. A pilot study will also be conducted before the innovation is implemented to ensure frontline staff members to be familiar with the emollient therapy. At the end, the effectiveness of the emollient therapy will be evaluated in terms of skin score. Patients’ outcome and healthcare provider’s outcome will also be evaluated.
An evidence-based guideline on emollient therapy for skin care in premature infants

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Declaration

I declare that this thesis represents my own work, except where due acknowledge 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 qualification.

Signed: _________________________________

HO WING YAN VIVIAN
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CHAPTER 1: STATEMENT OF THE PROBLEM

1.1 Introduction

With advanced medical technology, the survival rate of premature infants has continually increased in the past decade. Although many premature infants had congenital diseases due to underdeveloped organs and premature birth, they managed to survive under critical conditions thanks to the improvement of the medical technology. One of the problems that the premature babies suffer is immature skin barrier. Premature infants’ skin is too immature to provide effective epidermal barrier. Topical emollient therapy is believed to serve as a protective barrier to protect against the penetration of germs and protect the skin from percutaneous absorption of bacteria. Improving premature infants’ skin condition and protection are not urgent yet is an important issue. Skin acts as a guard on the whole body protection system. Skin breakdown in premature infants hence leads to serious consequences. The purpose of this paper is to investigate the effectiveness of prophylactic emollient therapy to improve premature babies’ skin condition and to determine which type of emollient will be the most suitable for prophylactic topical therapy.

1.2 Background
Premature babies who have compromised skin barrier function are facing high risk of infection because their skin barrier lacks the natural protective biofilm or has developed immaturity (Darmstadt et al., 2005). Therefore, their skin barrier easily gets injured. Premature babies’ skin develops dryness in the first week after birth. Superficial fissures can be noticed on their skin and cracks associated with bleeding may be resulted. Peeling or scaling dermatitis is often developed in premature infants. Due to the appearance of small wounds, the chance of infection increases. Complication of infections contributes to an estimated 50-75% of neonatal death (Darmstadt et al., 2004). According to Darmstadt et al.(2004), around two-third of global infant deaths occurred during the first month after birth. In developing countries, premature infants are born to be in high risk of mortality because of their skin barrier function is further compromised by malnutrition (Darmstadt et al., 2005).

In neonatal intensive care unit, cleansing of skin following the sterile procedures requires antiseptic solution. Although the antiseptic solution was proved to be absolutely safe for premature infants, contacting premature skin with antiseptic solution increases the risk of skin breakdown due to the osmolarity nature of the solution. By nature premature skin was weak, with addition to rinse with antiseptic solution, it added certain of damage to neonatal skin.
In developed countries such as USA, researches on application of emollient cream to premature neonates’ skin had been done for years, and the results on skin protection were appreciated. Evidence shows that enhancement of the skin barrier function by using topical emollient therapy during the neonatal period benefits premature babies. It can decrease transdermal water loss, conserve heat and energy for growth, make fluid and electrolyte stable and even prevent nosocomial sepsis (Darmstadt et al., 2005). Moisturizers help maintain and restore the natural skin protection properties. Emollient therapy was used widely over the world for enhancing skin barrier function due to its cost effectiveness (LeFevre, 2010). However, appropriate guidelines on duration and choice of emollient therapy for premature skin have not been issued.

Various emollient creams are commonly used in neonatal intensive care unit for premature babies. They can be divided into three types:

1. Nature oil e.g. sunflower seeds oil, olive oil etc.
2. Water-based emollient e.g. Aquaphor
3. Water-in-oil emollient cream e.g. Eucerin crème

Some types of emollient creams are commonly used in oversea countries but they may not be easily accessible in Hong Kong. However, results from emollient
therapy using these emollients were justified towards premature skin barrier enhancement.

In clinical setting of neonatal intensive care unit, a lot of efforts had been made to treat the immediate congenital or medical problems of premature babies after they were born. Somehow, little effort was paid towards the protection of neonatal skin. Though it is not an urgent matter per se, compromised skin barrier of low birth weight premature infants can lead to serious consequences such as thermal instability and insensible water loss of the premature infants. Therefore, prophylactic skin barrier enhancement and protection cannot be neglected. Topical application of ointment is an effective way to improve skin condition.

For current skin care actions in my workplace, inadequacy of skin protection and insufficient assessment for premature babies’ skin condition are the main concerns. There is no prophylactic skin care action to protect the skins of premature infants. It is not unusual that their skin develop dryness soon in their first week after birth. If procedures such as umbilical vein catheter insertion are applied to the premature infants, the use of antiseptic solution for skin disinfection will often further irritates the skin, causing redness or dryness. On the other hand, doctors and nurses only conduct skin assessment once during the premature infants’ new admission with no follow-up. There is no reference to compare and
keep progress of the premature infants’ skin condition. Doctors and nurses are on alert only when erythema appears. Moreover, there is no specific skin grading scale available to assess skin condition in my setting. Only subjective assessment on skin condition on overall integrity by nurse or doctor can be done if necessary. Detail assessment on visible scales, texture and fissures are neglected. Therefore, this is a severe issue in my clinical setting and improvements shall be made.

1.3 Affirming needs

1.3.1 Premature infants

Compromised skin barrier will affect the electrolytes balance, increase the insensible water loss, increase the length of stay of infants thus increase the chance of neonatal death.

1.3.2 Maternal relationship

Premature infants extend their length of stay in hospital due to compromised skin function. As a result, the mother-infant bonding time decreases.

1.3.3 Clinical staff and hospital

Workload of staff members and hospital cost will be increased if premature
infants encounter infection or illness due to poor skin protection and increase in length of stay.

1.4 Research question

Is emollient therapy the most appropriate for prophylactic application to premature infants to improve neonatal skin condition?

1.5 Objectives

1. To review published findings of emollient therapy

2. To appraise the literatures critically

3. To extract appropriate information from the literature and integrate them into table of evidence

4. To make summary and synthesis of the findings from selected literatures

1.6 Stating the significance

There is no routine nursing care on emollient therapy for premature infants. As a result, there is no protocols or guidelines for nurses to follow on how, when and where to apply emollient to achieve beneficial results. Even if nurses want to perform emollient therapy, there is no guideline to follow.

There are various creams and lotions available in the ward and pharmacy for choosing. A suitable emollient for premature infants shall be chosen base on
criteria such as cost, texture, feasibility of application and the effect on premature infants’ skin.
CHAPTER 2: REVIEW OF EVIDENCE

2.1 Searching strategies

In order to identify the literatures, three databases were undertaken: British Nursing Index, Pubmed and CINAHL (Cumulative Index to Nursing and Allied Health Literature). The time of publication of the literatures ranged from 1990 to August 2012.

The search keywords were mainly divided into three groups: premature infants, skin care and emollients. For premature infants, “premature infants”, “premature babies”, “preterm infants” and “preterm babies” were used as search keywords. For skin care, “skin”, “skin care” and “skin barrier” were used. For emollients, “emollients”, “cream”, “lotion” and “topical therapy” were used.

2.2 Inclusion criteria

Studies which conducted randomized controlled trial were included. The participants in the said studies who were premature infants less than 37 gestational weeks were included. Literatures written in English or Chinese were included for better understanding. The time of publication of the studies ranged from 1990 to August 2012.
2.3 Exclusion criteria

Studies using non-human e.g. mice, as subjects would be excluded. Premature infants with body weight below 1000g would be excluded because they would be too ill to be included in the studies. Studies which involve infant massage in intervention would be excluded as well.

2.4 Search result

The table of literature search strategy and results was attached in Appendix A. For the group of “premature infants” (S1), the search results generated 9359 articles in Pubmed, 1541 in CINAHL and 6760 in British Nursing Index. For articles about ‘skin” (S2), 5913 articles were searched in Pubmed, 208 articles in CINAHL and 3638 articles in British Nursing Index. For the group using “emollients” as the search keyword, 3610 results were found from Pubmed, 234 results from CINAHL and 370 results from British Nursing Index. Three groups (S1, S2 and S3) were combined using ‘AND” search. For articles with all three groups of keywords combined, 64 results were generated from Pubmed, 50 results were generated from CINAHL and 3 results were generated from British Nursing Index. These articles were then further screened independently by titles, filters, inclusion and exclusion criteria. At the end 6 and 4 articles were chosen from the
databases of Pubmed and CINAHL respectively. None was chosen from the database of British Nursing Index. The articles were checked against duplication and 5 search results remained as a result. On the other hand, two literatures were chosen by manual search. At the end, 7 articles were chosen to undergo data extraction.

2.5 Data extraction

The findings and information from 7 literatures were extracted and integrated into table of evidence (Appendix B), with reference to Scottish Intercollegiate Guidelines Network (SIGN) grading system for assessing the quality of randomized controlled trial studies. The level of evidence of the selected studies was reviewed by using the SIGN grading system.

2.6 Quality assessment

The quality of the studies was assessed using the checklist referred to in Scottish Intercollegiate Guidelines Network (SIGN) in National Health Service (NHS) in Scotland (Appendix C). The methodology checklist for randomized controlled trial was used. Base on the 10 items from the checklist, the internal validity for the 7 studies was assessed (Appendix D). The studies were classified
into good, fair or poor quality according to the criteria fulfilled. Studies with good quality fulfilled most or all of the criteria in the methodology checklist. Those items that have not been reviewed were very unlikely to alter the conclusion of the study. The studies with fair quality refer to literatures with some of the criteria fulfilled and those unfulfilled criteria are thought to be unlikely to alter the conclusion. The studies with few or no criteria fulfilled would be classified as poor quality and its conclusion is likely or very likely to be altered.

Two studies are rated as good quality to which “++” represent its level of confidence (Lane & Drost, 1993; Pabst et al., 1999). Three studies are rated fair to which “+” is given (Darmstadt et al., 2007; Darmstadt, et al., 2005 & Kohlendorfer, Berger & Inzinger, 2008) and two studies rated as poor quality to which “-” is used to represent (Darmstadt et al., 2004 & Nopper et al., 1996).

All studies randomized controlled trial. All studies addressed appropriate, clear and focused question on premature infants, skin care and emollient therapy. All studies claimed that the assignment of subjects to treatment groups was randomized. However, only one study well described the randomization method, namely using blocks of six (Darmstadt et al., 2005), and four other studies addressed the randomization method adequately (Lane & Drost, 1993; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008; Pabst et al., 1999). The
concealment method were either poorly addressed or not addressed at all except in one study (Darmstadt, et al., 2005). In five studies (Darmstadt et al., 2007; Lane & Drost, 1993; Darmstadt, et al., 2005; Kohlendorfer, Berger & Inzinger, 2008; Pabst et al., 1999), subjects and investigators were kept “blind” about the treatment allocation. In those studies, doctors were the investigators. To ensure they were unaware of the allocation, nurses performed the emollient treatment when doctors were not in the ward. In all seven studies, the treatments and control groups were similarly treated at the beginning of each trial as to the baseline assessment such as skin assessment and procedures performed such as blood culture and skin culture saving. No major differences between the treatment and control groups before the start are noticed. In all studies, the only difference between the treatment and control group was the use of emollient therapy for investigation. The control groups continued standard skin care procedures without any lotion or cream applied. This is adequately addressed in all studies.

The outcomes were measured in a valid and reliable way in all studies. The p-values were presented clearly therein after statistical analysis. Four studies recorded the dropout rate was 0% in the respective studies (Darmstadt et al., 2004; Darmstadt et al., 2007; Lane & Drost, 1993 & Pabst et al., 1999). The remaining three studies did not report the dropout rate. (Darmstadt, et al., 2005; Nopper et al.,
1996; Kohlendorfer, Berger & Inzinger, 2008). It is not surprising to get 0% dropout in studies carried out in NICU. The premature infants stayed in NICU for treatment of medical problems which contributed at least 2 weeks or more. Therefore, studies for emollient therapy could be conducted smoothly without interruption. All the subjects were analyzed in groups to which they are allocated randomly. The “intention to treat” analysis is adequately addressed in four studies (Darmstadt, et al., 2005; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008; Pabst et al., 1999). Four studies are conducted within one clinical setting (Darmstadt et al., 2007; Lane & Drost, 1993; Nopper et al., 1996; Pabst et al., 1999) and three other studies were conducted in more than one sites (Darmstadt et al., 2004; Darmstadt, et al., 2005; Nopper et al., 1996) and results were compared thereafter.

2.7 Summary

2.7.1 Sample characteristics

Most literatures mentioned the mean gestational age and body weight (birth weight or weight at enrolment). The mean gestational age of the treatment group was between 28.3 to 32.3 weeks while it was 27.5 to 32.5 weeks for the control group in six studies. (Darmstadt et al., 2004; Lane & Drost, 1993; Darmstadt, et
al., 2005; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008; Pabst et al., 1999). One study did not mention the mean gestational age specifically. The mean body weight was mentioned in five studies. (Darmstadt et al., 2004; Darmstadt, et al., 2005; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008 & Pabst et al., 1999). For treatment group, the body weight was in the range of between 1232g to 1459g. For control group, the body weight was in the range of between 1201g to 1583g. The mean body weight was not mentioned in two literatures (Darmstadt et al., 2007 & Lane & Drost, 1993). In all studies, the subjects were recruited within 72 hours after birth. Those who were older than 3 days were not included. All subjects did not have congenital abnormality or severe skin disease. The length of stay for the subjects in neonatal intensive care unit or special care unit was at least 14 days before discharge. In Lane (1993), the intervention was applied for a period of maximum 16 days or until discharge if the subject stayed shorter than 16 days. Two studies were conducted for up to 28 days to complete the treatment (Darmstadt et al., 2004 & 2007).

2.7.2 Intervention

The method of application of emollient cream, location to apply, frequency to apply and choice of emollient were summarized in this section. For the location to apply emollient, all studies suggested to the emollient should be applied to
entire body surface except the face and scalp. Darmstadt et al. (2007) suggested that intravenous site should be avoided. Emollient was applied according to specific dosing as scheduled. Three literatures recorded that 4 grams of emollients were applied per kilogram of body weight of the premature infants (Darmstadt et al., 2004; 2005 & 2007). Details of storage and dispensing of the emollient were only mentioned in these 3 literatures as well. To prevent the emollients from contamination and oxidation, they were kept refrigerated with stock replaced every 2 months (Darmstadt et al., 2004, 2005 & 2007). Individual patient had sterile container for the emollient placed at bedside with the sterile container changed every 2 to 3 days. The application and dispensing of emollients were under sterile procedures (Darmstadt et al., 2004; 2005 & 2007). The emollient was applied by nurses as stated in one literature (Darmstadt et al., 2007) while it is not mentioned in other literatures. Two literatures mentioned that 1.5ml emollient should be applied if it was in aqueous form (Nopper et al., 1996 & Pabst et al., 1999). If the emollient was supplied in small tubes by the medical company, it was considered as single use per tube (Darmstadt et al., 2007) or the tube contained enough emollient to be applied to neonate for one-day-use (Kohlendorfer, Berger & Inzinger, 2008). The risk of contamination was thus lowered.
For the frequency of application, three literatures suggested to apply three times daily for 14 days then twice daily until discharge (Darmstadt et al., 2004; 2005 & 2007). Three journals suggested to apply the emollient twice daily for (1) up to 14 days (Pabst et al., 1999); (2) a maximum of 16 days until discharge (Lane & Drost, 1993); and (3) up to 28 days (Kohlendorfer, Berger & Inzinger, 2008) while another journal suggested to apply the emollient every 12 hours for 14 days (Nopper et al., 1996).

The choice of emollient in treatment group varied in seven literatures. Sunflower seed oil was used in three studies (Darmstadt et al., 2004, 2005 & 2007). Aquaphor the water-based emollient was also used in three studies (Nopper et al., 1996, Darmstadt et al., 2007 & Pabst et al., 1999). One study used Eucerin cream, the water-in-oil emollient, in the treatment group (Lane & Drost, 1993) and one study used Bepanthen, the water-in-oil emollient, and olive oil in the treatment group (Kohlendorfer, Berger & Inzinger, 2008).

2.7.3 Outcome measurement

2.7.3.1 Skin condition

Skin condition improvement was the major outcome of the studies. All journals showed that skin condition significantly improved after emollient therapy.
Skin condition was evaluated in terms of skin score which was a 9-point grading scale (Darmstadt et al., 2007; Lane & Drost, 1993; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008; Pabst et al., 1999). The numeric scale from 0 to 9 was given to grade the skin condition. The score of “0” indicated normal skin without signs of dryness while the score of “9” represented severe dermatitis involving erythema, dark scale and oozing skin in entire area. The lower the score represented the better skin condition. After organizing and comparing numeric grades among the 6 literatures, it is discovered that the mean skin score in treatment group was in the range of 0.06 to 1.67 while it was in the range of 1.03-2.11 for control group. The p value was < 0.05 in the studies (Darmstadt et al., 2007; Lane & Drost, 1993; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008; Pabst et al., 1999). In Darmstadt et al. (2004), the score in control group increased contrary to the decrease of score in treatment group using sunflower seed oil in first 28 days with a p value of 0.037. It means the skin condition in control group had slightly worsened. In Darmstadt et al. (2007), lower skin score was found in the treatment group using sunflower seed oil and aquaphor when compared with control group, with p values for both groups were <0.01. In Lane & Drost (1993), the skin score in the treatment group using Eucerin (with a p value of 0.0021) was significantly lower than that of the
control group and dermatitis had been decreasing from day 7 to 11. In Nopper et al. (1996), after emollient treatment using aquaphor in the treatment group, the premature infants’ skin condition had significantly improved, especially on day 7 and 14, with their p values 0.001 and 0.0004 respectively.

Significant improvements were noticed in treatment group using Bepanthen cream and olive oil as compared with control group in week 2 (Kohlendorfer, Berger & Inzinger, 2008). The p value was smaller than 0.001 in that treatment group. In Pabst et al. (1999), the premature infants’ skin condition in treatment group using aquaphor was significantly better than that of control group. The p value was smaller than 0.002 in that treatment group. On the contrary, the premature infants’ skin condition had significantly worsened in control group over time.

2.7.3.2 Transdermal water loss (TEWL)

Apart from improvement in the skin condition, other outcomes were also reported in some of the studies. In particular, two journals investigated transdermal water loss (TEWL) of the premature infants’ skin (Lane & Drost, 1993 & Nopper et al., 1996). The TEWL was measured by means of the EP1 Evaporimeter which was supplied by some medical companies. Dorsal aspect of
bilateral forearms and lateral aspect of the calf and both sides of trunk were measured in the study of Nopper et al. (1996). In Lane & Drost (1993), dorsum of the hands, dorsum of feet and abdominal area were targeted for TWEL evaluation. According to Nopper et al. (1996), there was an immediate effect within 60 minutes after emollient therapy. The transdermal water loss before and after the treatment were compared. The results were distinct when compared with the control group (p= 0.0001 for the treatment group). After two weeks of treatment, the treatment and control groups were evaluated again. The TWEL significantly reduced after 14 days with p value of 0.04 in the treatment group. As reported by Lane & Drost (1993), although the transdermal water loss of abdomen and thigh decreased after the application of emollient, the result was not that remarkable.

2.7.3.3 Infection rate

Five literatures evaluated the infection rate (Darmstadt et al., 2004, 2005 & 2007; Lane & Drost, 1993; Nopper et al., 1996) in terms of positive blood cultures. After applying sunflower seed oil, the infection rate had significantly decreased in 3 studies when comparing treatment group and control group. In Darmstadt et al. (2004), the infection rate in treatment group is 29% while that in the control group is 47%. In Darmstadt et al. (2005), the infection rate in
treatment group is 6.95% and that in the control group is 10.8%. In Darmstadt et al. (2007), the infection rate is 3.8% in treatment group and 6.1% in control group.

In the two literatures using aquaphor as emollient, the results showed that the treatments were effective in decreasing infection rate (Darmstadt et al., 2007 & Nopper et al., 1996). The infection rate in the treatment group is 3.3% while that in the control group is 26.7% (Nopper et al., 1996). However, in Darmstadt et al. (2005), the infection rate was 7.16% in treatment group while it was 10.8% in control group. There was a decrease in infection rate yet not significant (p=0.065).

2.7.3.4 Skin colonization

Studies on skin colonization were only done using aquaphor as emollient (Darmstadt et al., 2007; Nopper et al., 1996 & Pabst et al., 1999). In these three literatures, skin cultures or matched blood to skin culture were under investigation. Only Nopper et al. (1996) with p value of 0.008 showed significant reduction on axilla area on day 14. The other two studies showed skin colonization reduction but not to a significant extent (Darmstadt et al., 2007 & Pabst et al., 1999).
2.7.3.5 *Dermatitis, mortality, fluid requirement and weight gain or loss*

Apart from sunflower seed oil and aquaphor, Eucerin cream (Lane & Drost, 1993) and olive oil or water-in-oil emollient Bepanthen cream (Kohlendorfer, Berger & Inzinger, 2008) were used in emollient therapy.

The occurrence of dermatitis significantly decreased in treatment group using Eucerin cream (Kohlendorfer, Berger & Inzinger, 2008) and olive oil or Bepanthen cream (Kohlendorfer, Berger & Inzinger, 2008).

One journal evaluated also the mortality rate (Darmstadt et al., 2004). However, the mortality rate was not significantly different in the treatment and control group.

Two journals evaluated the fluid requirement and weight gain or loss (Nopper et al., 1996; Pabst et al., 1999). However, the results showed that there was no significant improvement in terms of fluid requirement and weight gain.

2.7.4 Synthesis of the data

Among the studies, six of them were carried out in neonatal intensive care units and one was carried out in a special care nursery. It implies that the emollient therapy can be applied in NICU. Majority of the studies were performed in NICU settings, which proves NICU would be a suitable place for the emollient
therapy to be applied.

The mean gestational age and mean body weight for the premature infants in both treatment and control groups were approximately around 28 to 32 weeks and between 1200g to 1500g respectively. It implies that the emollient therapy could be focused on premature infants within the said range of gestation. They were very–low-birth-weight (VLBW) infants, which is defined as weighing less than 1500g at birth.

The emollient can be applied to the entire body except the face and scalp. This is supported by majority of the studies. Intravenous sites should also be avoided (Darmstadt et al., 2007). In addition, central catheters and arterial line catheters should be avoided to prevent loosening of strapping and also to lower the risk of infection. The application and dispensing of emollient will be under sterile procedures. The stock may not require to be refrigerated as suggested in some literatures (Darmstadt et al., 2004, 2005 & 2007), because other studies did not suggest doing so. The cream should be changed every 2-3 days as suggested to stay fresh and prevent contamination (Darmstadt et al., 2004, 2005 & 2007). The amount of emollient can be varied depending on the body surface area of premature infants. We can take reference from the literatures, in which 4 grams of emollient per kg of body weight or 1.5ml aqueous emollient were used. Yet the
amount need not be exact for the outcome to be affected.

Majority of the literatures mentioned the frequency of application of emollient was twice daily (Lane & Drost, 1993; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008; Pabst et al., 1999; Darmstadt et al., 2004, 2005 & 2007). The effectiveness was significant according to the above literatures. As to the duration of the application period, it was suggested that the application should at least last for 14 days with possible extension of the period depending on the premature infants’ condition.

As suggested by the literatures, premature infant skin assessment would be conducted once upon admission. The post emollient therapy skin assessment would be conducted 10-12 hours after emollient therapy which would be conducted twice per week for 14 days (Lane & Drost, 1993; Nopper et al., 1996; Pabst et al., 1999). Skin assessment could be conducted right before the next episode of emollient therapy together with routine nursing care. Minimal handling was important to premature infants to reduce stimulation and to enforce stability of vital signs. Clustering all nursing care work can help achieve that goal. On the other hand, it is not necessary to perform skin assessment so frequently because it is a kind of prophylactic nursing care that may not have instant effect. Twice per week assessment will be enough. The effectiveness of emollient therapy on
premature infants’ skin condition was proved in various literatures.

Five types of emollient gave positive effect on premature infant’s skin condition. On top of improving skin condition, different emollients possess other different benefits towards the premature infants. For example, sunflower seed oil would reduce infection rate; Aquaphor would decrease transdermal water loss, reduce infection rate and skin bacterial colonization; Eucerin crème would decrease transdermal water loss but not as effective as aquaphor, and it would also lower the chance of dermatitis occurrence, in this sense the eucerin crème possess the same function as olive oil and Bepanthen crème. Taking into account the functions of different emollients, aquaphor would be considered the best choice of emollient for the therapy.
CHAPTER 3: THE IMPLEMENTATION POTENTIAL

The previous chapter has documented that the use of emollient therapy to premature babies is an effective method to improve skin condition and to enhance skin barrier function. The implementation potential is assessed by the transferability of the findings, feasibility and cost/benefit ratio of the innovation.

3.1 Target population and settings

The target population is premature babies admitted to neonatal intensive care unit with gestational week between 28 and 32 whose body weights are greater than 1200g. Those who are below 1200g are too weak to be involved in the innovation. The premature babies with severe skin diseases will also be excluded (Darmstadt et al., 2005; Kohlendorfer, Berger & Inzinger, 2008).

The target setting is in neonatal intensive care unit. This is similar to the setting in the literatures. (Darmstadt et al, 2004; Darmstadt, et al., 2005; Nopper et al, 1996; Kohlendorfer, Berger & Inzinger, 2008 & Pabst et al., 1999)

3.2 Transferability of the findings

The following areas are considered the assessment of the transferability of the findings.
3.2.1 Similarity of target population and setting

The innovation will be carried out in one of the NICUs in a public hospital. The NICU consists of 9 beds and the usual bed occupancy is around 100%. From the literatures that were reviewed, 6 studies were carried out in NICU (Darmstadt et al., 2004, 2005 & 2007; Nopper et al, 1996; Kohlendorfer, Berger & Inzinger, 2008 & Pabst et al., 1999). The innovation will fit in the proposed setting as it is similar to those of the studies.

3.2.2 Target population

In the target clinical setting, gestational age of the babies admitted in NICU ranged from 26 weeks to 37 weeks, depending on their congenital problem. Those who had gestational age 26-33 weeks shared common prematurity skin problems. This gestational age was similar to those of the population in the studies, which reported the range of gestational age was between 28-32 weeks (Darmstadt et al., 2004 & 2005; Lane & Dross, 1993; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008; Pabst et al., 1999). The target population will be premature babies with gestational weeks between 28 and 32 whose body weights are greater than 1200g, which is similar to those of the population in the studies.

3.2.3 Philosophy of care
Neonatal nursing care and management of critically ill neonates facilitate the transition process of the neonates to their extra-uterine life (Hospital Authority, 2003). All of the studies show similar philosophy of care. The goal of which is to provide quality care to preterm babies and to facilitate their healing process. The philosophy of care in my department is to deliver the best quality care service base on safe practice and patient-centered care. It aims to achieve the best outcome for sick newborn and premature babies as well as their families. Implementing the innovation will help prevent skin breakdown thus promotes healing process (Darmstadt et al., 2004 & 2007; Lane & Dross, 1993; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008; Pabst et al., 1999). The amount of emollient to be applied is calculated according their respective body weight to achieve the best prophylactic effect (Darmstadt et al., 2004, 2005 & 2007). With similar philosophy of care, the innovation can be transferred to the target ward for application.

3.2.4 Implementation plan and evaluation time

A pilot testing will be held for two weeks follow by an evaluation of two weeks. At the end of the pilot testing, close-ended questionnaires will be distributed to ward staff to collect feedbacks and opinions on the pilot study. The
evaluation will focus on logistic matters and staff compliance with regard to the emollient therapy. Premature babies’ skin condition will not be evaluated in these two weeks of evaluation. After evaluation, the content of the emollient therapy guideline will be revised and adjusted. The final version of the guideline will be announced during the nursing handover.

It takes one year to implement the innovation. An annual evaluation ward meeting will be held towards the end of the implementation.

The details will be discussed in chapter 5: Implementation plan.

3.3 Feasibility

The feasibility of carrying the innovation is assessed as follows:

3.3.1 Freedom to carry out

The workload for administering emollient or putting on emollient cream is not heavy. Emollient does not contain any medicine so it is not necessary to be prescribed by a doctor. The department of Pediatric and Adolescent protocol states that nurses can apply lotion and cream when the premature babies’ skins are dry. Therefore, nurses have authority to conduct emollient therapy according to the premature babies’ clinical condition.
3.3.2 Interfere with staff workload

It may cause fair amount of interference with staff workload. Skin care is part of nursing care and nursing job. There is no special technique required when applying emollient on babies’ skin. Therefore, no special training is required. It is not necessary for staff members to spend extra time or extra effort to attend training course about emollient therapy, hence workload will not be increased. It will not cause manpower shortage or affect the manpower allocation in a ward. The main concern will be staff compliance. Some nursing staffs need time to adapt to the new practice and some may be resistant to change. A pilot testing provides a buffering period to facilitate nursing staff to be familiar with the emollient therapy.

3.3.3 Support from administration

The innovation is beneficial to promoting health of premature babies. It helps improve skin barrier function of premature babies as emollient therapy is widely used for promoting skin care for premature babies (Darmstadt et al, 2004, 2005 & 2007; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008 & Pabst et al., 1999). From the evidences of 6 studies, skin condition is improved after applying the emollient. Our administrative staff, including COS, ward manager, doctors
and clinical staff, always aim for better living of premature babies and better quality of care. The innovation meets the ultimate goals.

3.3.4 Organization climate

The organization climate is prone to be academic and research-based. Most of our nursing protocols and nursing care practices are evidence-based. There is a journal sharing each month. Each staff member has to make one presentation about nursing related practice once a year. They need to attend colleagues’ presentation at least 4 times every year to receive updated information. Emollient therapy is proved to be effective in improving premature babies’ skin condition, thus beneficial to them. It is evidence-based innovation thus suitable to be introduced to our staff members and should not be opposed by them.

3.3.5 Reaching consensus in carrying out the innovation

There may be some obstacles and restrictions in carrying out an innovation. Some staff members may consider carrying out the innovation as time consuming as it involves extra nursing care work.

Nurses and staff members are generally willing to improve nursing practice for the premature babies. For the innovation of emollient therapy, there is no
special technique required. It is easy to be handled by staff members, therefore a clear and concrete guideline should gain cooperation from them. As a result, a consensus can still be reached in carrying out the innovation by distributing the information extracted from journal despite the above-said difficulties.

3.3.6 Friction within the organization

The innovation will be carried out in a neonatal intensive care unit in our department, namely the Department of Paediatrics & Adolescent Medicine. Since it does not involve inter-department coordination, there will be no friction with other departments in the hospital. The major party involved in the innovation will be the nurses. Doctors are not involved so that no friction is anticipated between the doctors and nurses.

3.3.7 Equipment and facilities needed

No special piece of equipment and facility is needed for the emollient therapy, so it is highly feasible to be carried out. A spare room with chairs, a projector and a screen would be needed for briefing session. Purchasing stationery, papers, emollient cream and containers will be the main expenses. Photocopying charges are also anticipated. The equipment is available in our neonatal intensive...
care unit and it will be easy for us to borrow. Emollient and sterile bottle as containers are the major equipment needed for the innovation. The total amount required and the cost of the said equipment will be discussed later in the “Cost-Benefit ratio of the innovation”

3.3.8 Evaluation

The evaluation process is easy and simple. Comments from staff members would be collected by distributing close-ended questionnaires, satisfaction level survey and convening focus group interview. Questionnaires will be distributed to nursing staff to collect feedback on staff compliance and logistic matters concerning the emollient therapy in the pilot testing. Focus group interview will be held by organizing committee for revising and adjusting the guidelines. Final version of protocols will be distributed to nursing staff at the end.

3.4 Cost-Benefit ratio of the innovation

3.4.1 Risk of implementing the proposed innovation to clients

Though researches show clearly that emollient therapy does not have potential risks on premature babies (Darmstadt et al., 2004; Lane & Drost, 1993; Nopper et al., 1996; Pabst et al., 1999), emollient therapy indirectly increases the
risk of catheter dislodgement. While emollient is put on premature babies’ skin, the adhesive tapes such as tegaderm and micropore are no longer sticky enough for securing intravanesous catheters such as heparin blocks. Those areas should be avoided (which are approximately around 4cm x 3cm each) for emollient therapy or clean the skin thoroughly before inserting and securing new heparin block. Nevertheless, the risk is relatively low because nursing staff will closely monitor the drip site every hour in NICU.

3.4.2 Potential benefits from the implementation of the proposed innovation

Premature babies and mothers will be benefited from the innovation as the babies’ skin condition will be improved (Darmstadt et al., 2004 &2007; Lane & Drost, 1993; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008 & Pabst et al., 1999). The skin improvement resulted in reducing transdermal water loss (Lane & Drost, 1993; Nopper et al., 1996) and decreasing infection rate (Darmstadt et al., 2004, 2005 &2007; Lane & Drost, 1993; Nopper et al., 1996). These main benefits are important to the care of premature babies as the length of hospital stay can be shortened and the chance of neonatal death can be lowered (Darmstadt et al., 2004). The mother-infant bonding will not be affected
as a result (Nopper et al., 1996).

3.4.3 Potential risk of maintaining current practice

Premature babies are born with compromised skin barrier. It is susceptible to infection since the skin protective barrier does not develop well. Without the innovation, the percentage of transdermal water loss of the premature babies as well as the infection rate will be increased. Apart from that, daily procedures such as the use of antiseptic solution will increase the risk of skin break down. If the premature babies stay longer in the hospital as a result, it will enhance stress and worries of parents as well.

3.4.5 Cost of material in the implementation of the innovation

In this innovation, no training cost will be incurred but only the material cost. The material cost includes paper charges for photocopying the guidelines and questionnaires, purchasing the emollient cream or lotion and purchasing the sterile containers. The said cost will be covered as the ward general expenses from our department, namely the Department of Paediatrics & Adolescent Medicine.

The cost and expenditure table of the innovation can be found in appendix E.
1.5ml of emollient will be used in each emollient therapy (Pabst et al., 1999 & Nopper et al., 1996). It shall be applied twice a day. Therefore the amount needed is 1.5x2 = 3ml/day/baby. Cost of aquaphor cream is $0.238/ml. The price for a case per day is $0.238 x 1.5 x 2 = $0.714.

The container for emollient shall be changed every 2-day as recommended in the studies (Darmstadt et al., 2004, 2005 & 2007). The cost of each container bottle is $0.5. The cost of bottle for a case per day is $0.5 x 1/2 = $0.25.

Other material cost such as paper is $0.01/sheet/chart. The cost of paper used in a day is $0.01 x 2 = $0.02

The total material cost for a case per day is $0.714+0.25+0.02 = $0.984

According to the data retrieved from the neonatal intensive care unit, the average number of admission in NICU in the fourth quarter of 2012 is 14.3 per month. Out of these admissions, 58% of them can be regarded as the target population.

That means the average number of admissions that can receive emollient therapy will be 8.3 per month.

The duration for each emollient therapy is 14 days for each case. As a result, the approximate average material cost corresponding to each NICU admission per month is $0.984 x 8.3 x 14 = $114.34. For a two-month pilot testing, the cost will be $114.34 x 2 = $228.7. For a one year innovation, the material cost will be $
114.34 \times 12 = \$1372.1.

Three nursing staff member will be included in evaluation process and their approximate hourly salary will be calculated. Two hours are estimated to be used for an evaluation. The material cost will be ($191 \times 3 \times 2\text{hr}) = \$1146

As a result, total cost of expenditure of implementing the emollient therapy in the first year is:

\$ 228.7 + 1372.1 + 1146

= \$2746.8

3.4.6 Potential non-material cost and benefits of implementing the innovation to the organization

There is no training cost. However, allocation of manpower will be needed when some staff members attending the briefing sessions. Hourly rate of registered nurses will be included in the non-material cost.

The said cost will be:

\textit{Number of staff members} \times \textit{hourly rate} \times \textit{briefing session (1/2 hour)}

By implementing the emollient therapy, skin condition as well as the quality of health will be improved. Parents will be happier and have more confidence in the ward staff. Nurse-client relationship and bonding will be strengthened.

Nursing staff will be happier and their morale in the ward will be boosted.
CHAPTER 4: EVIDENCED-BASED PRACTICE

GUIDELINE

4.1 Title

Guideline on applying emollient therapy to premature babies

4.2 Intended users

The registered nurses in NICU in public hospital

4.3 Purpose of the proposed guideline

1. To improve skin condition of premature babies.

2. To minimize skin breakdown.

3. To guide nurses on providing evidence-based skin care.

4. To ensure the premature babies receiving standardized, consistant and effective skin care.

4.4 Target group

Premature babies who are

- Gestational week between 28 and 32

- Body weights are greater than 1200g.
- Medically stable

4.5 Outcome

Premature babies’ skin will be improved and skin breakdown will be prevented.

4.6 Major recommendations

4.6.1 Recommendation 1.0

Target population should be medically stable and have no severe skin diseases.

Available evidence:

- The target groups in the studies have no skin defect >5% of body surface area of premature babies. (Darmstadt et al., 2007)(1+)

- Premature babies should have no major abnormality and surgical procedures required, no skin infection or generalized skin disease, no structural problem affecting more than 5% of body surface area (Darmstadt et al., 2005)(1+)

- No life threatening abnormality or skin disease in premature infants.

(Kohlendorfer, Berger & Inzinger, 2008)(1+)

Grade of recommendation: A

4.6.2 Recommendation 2.0
Use aquaphor cream on premature infants.

Available evidence:

- Premature babies in aquaphor group have better skin condition than those babies have usual skin care only. ((Darmstadt et al., 2007)(1+); (Nopper et al., 1996)(1-); (Pabst et al., 1999)(1++)

- Transdermal water loss was decreased in the group of premature babies applying aquaphor when compared with usual skin care. (Nopper et al., 1996) (1-)

- Incident of infection was significantly reduced in aquaphor group than those only have usual skin care (Darmstadt et al., 2007)(1+); (Nopper et al., 1996) (1-);

- Aquaphor helps to reduce skin bacterial colonization (Nopper et al., 1996) (1-)

*Grade of recommendation: A*

4.6.3 Recommendation 3.0

Apply cream to entire body surface except scalp, face and IV site

Available evidence:

- All researches suggested applying cream to entire body, except face and scalp.

  (Darmstadt et al., 2004 (1-), 2005 (1+) & 2007 (1+); Lane & Drost, 1993
(1++); (Nopper et al.,1996)(1-); Kohlendorfer, Berger & Inzinger, 2008 (1+)

& Pabst et al.,1999)(1++)

- Avoid the IV sites (Darmstadt et al., 2007) (1+) because it is covered with tegaderm.

Grade of recommendation: A

4.6.4 Recommendation 4.0

Apply 1.5ml aquaphor each time under clean procedure.

Available evidence:

- The premature babies received 1.5ml of aquaphor applied to the entire body with good effect (Pabst et al.,1999) (1++)

- The treated group of infants had 1.5ml of preservative free ointment, Aquaphor, applying on skin with good effect. (Nopper et al.,1996) (1-)

Grade of recommendation: A

4.6.5 Recommendation 4.1

Apply the aquaphor twice a day

Available evidence

- Applied twice a day for 14 days or until discharge before 16th day or
maximum 16 days. (Pabst et al., 1999) (1++) (Lane & Drost, 1993 (1+),

- Applied cream twice a day and maximum of 4 week. (Kohlendorfer, Berger & Inzinger, 2008) (1+)

- *Grade of recommendation: A*

4.6.6 Recommendation 4.2

**Apply emollient therapy for 14 days.**

14 days will be chosen as the duration of innovation the effect in the studies is optimum.

Available evidence:

- Applied twice daily for 14 days. (Pabst et al., 1999) (1++)

*Grade of recommendation: A*

4.6.7 Recommendation 4.3

**To stop the treatment if the premature baby’s condition deteriorates.**

Available evidence:

- The population should be medically stable and had no life threatening abnormality. (Kohlendorfer, Berger & Inzinger, 2008) (1+); (Darmstadt et al., 2007) (1+)
- **Grade of recommendation: A**
CHAPTER 5: IMPLEMENTATION PLAN

5.1 Communication plan with potential users

In this chapter the implementation plan and the evaluation plan will be discussed. It includes a plan to communicate with potential stakeholders and to carry out the pilot testing before the implementation of the guidelines. Evaluation and determination of the effectiveness guideline will also be discussed.

5.2 Stakeholders

Identifying the stakeholders of the guideline is the first step to formulate a communication plan.

The administrators of the neonatal and pediatrics department, namely the Chief of Service (COS), the Departmental Operation Manager (DOM), senior medical officers, the ward manager, the nursing officers and advanced practice nurses, are important personnel to approve the carrying out of the new intervention, new protocol and changes of daily routine. Approval and allocation of resources and manpower for new intervals are also planned by administrators.

Frontline staff members, including medical officers and registered nurses are also the stakeholders in the implementation plan, as medical officers will prescribe the treatment and nurses will apply the emollient therapy and monitor
the effects. They are also the key persons to give comments and feedback in the final evaluation.

The premature babies and parents are also the stakeholders. Premature babies are the recipients. They cannot give comments but they play an important role in the process. On the other hand, parents are the guardians of the babies. They may observe the skin condition of the premature babies during the implementation and give feedback when necessary.

### 5.3 Communication process

In order to carry out the intervention smoothly, it is important to explain the intervention to different parties. The purpose is to build up their support and confidence in the intervention, so that they can better cooperate to successfully implement the intervention.

### 5.4 Communicate the plan with administrators

The first step is to communicate with the management team in order to obtain the key personnel’s support. They have great influence on the adoption of new guidelines to clinical settings. Therefore, we have to obtain permission from them before implementing the guidelines. The leaders’ support can lead to
positive staff attitude and belief that promote changes in the clinical setting (Ellis, Howard, Larson & Robertson, 2005). A proposal, which introduces the idea and content of new intervention, will be sent to the COS, DOM, senior medical officers, the ward manager and nursing officers. It is written in a precise and organized format that makes it easy for people to understand. The content of the said proposal introduces the background information, the reasons for change of practice and the benefits of the intervention to premature babies and nursing staff. Moreover, it analyses the feasibility of adopting the intervention, resources and manpower allocation and the budget needed per year. It shall be emphasized that the new intervention will result in many benefits without leading to great influence in routine work.

The proposal is presented to the administrators half year before the innovation starts in order to seek their approval. In my ward, there is regular monthly meeting between doctors and nurses. Any change of practice will be announced and discussed.

5.5 Communication plan with committee members

There will be three registered nurses and a medical officer to form a committee for the innovation. Committee members are persons in charge of the
planning and the evaluation process. Ward staff can contact the committee members whenever they come across with difficulties about the innovation. An one hour meeting will be held among committee members monthly. The first meeting will be held after the proposal is approved by the administrations. During the first meeting, the time frame for implementation of the innovation will be discussed. The rationale of the intervention and the necessity of changes in practice will be explained so that the committee members are able to explain to other ward staff members when necessary. The details of the intervention will be provided and procedures of the guideline of emollient therapy will be explained. The second meeting will be held 2 weeks after implementing the pilot study to evaluate the result before proceeding to the implementation of the intervention.

5.6 Communication plan with frontline nursing staff

Identical briefing sessions will be organized twice a week for frontline nursing staff members. Approximately four to five sessions are needed to ensure all nurses of different shifts attended at least once. The briefing session will be conducted during working hours so that the nurses need not to spend extra time outside work to attend the briefing session. The briefing sessions will be hosted by me personally. Each session will last for around 30 minutes. The rundown of a
briefing session can be found in appendix F. During the briefing session, the aims and objectives of the intervention as well as the content of the intervention will be introduced. Emollient therapy information sheet will also be distributed. The rationale of implementing the emollient therapy will as well be addressed by showing statistics and literature reviews. Moreover, the neonatal skin condition score chart will be distributed. More importantly, details of the emollient therapy will be explained including target population, type of emollient use, when to start, where to apply, and frequency of application, the amount of emollient needed, storage method, duration of therapy and time of termination. The advantages and benefits of the innovation to the target premature babies will also be explained. Besides that, the potential difficulties and interferences to ward’s daily routine will be addressed. The frontline staff members will be reassured that only minimal influence to nursing routine will be caused by the intervention. There will be a question and answer session at the end of the briefing so that the staff members can give opinions.

5.7 Communication plan with parents

The emollient therapy will be explained to the parents when they visit their premature babies. The benefits of the emollient therapy will also be explained to
the parents. Since emollient therapy is not an invasive procedure that induces pain or serious complication, written consent from the parents is not required, yet it still requires verbal consent from the parents. Parents have the right to choose whether their babies will receive the emollient therapy or not.

5.8 Pilot Testing

Pilot testing will be conducted before the implementation of any new practice. It is an important step. The aim of pilot testing is to provide buffer time for staff members to familiarize with the implementation of the new practice. It also determines the feasibility of the new practice and provides an opportunity to avoid or tackle the potential difficulties. The pilot testing will last for two weeks then follow by an evaluation of two weeks. The target group will be physically stable premature babies whose gestational age is between 28 and 32 weeks. Their body weights shall be greater than 1200g.

Here is the flowchart and timeframe of the implementation of the innovation

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar (early)</th>
<th>Mar (late)</th>
<th>Apr</th>
<th>Apr (next year)</th>
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<tr>
<td>Form committee</td>
<td>Briefing session</td>
<td>Pilot testing</td>
<td>Evaluation</td>
<td>Innovation</td>
<td>Annual evaluation</td>
</tr>
</tbody>
</table>

After giving the briefing session to all frontline nursing staff members, pilot
emollient therapy will begin.

The nursing staff members will start applying the emollient therapy to premature babies according to the guidelines tested in the pilot testing. Only a few frontline nurses may be involved in applying emollient therapy during the pilot testing because the number of cases that falls into the target population depends on the admission of the premature infants. After two weeks of pilot testing, the staff members who gave emollient therapy will be invited to complete the close-ended questionnaires and the satisfaction level survey. The questionnaires are attached in appendix G and H. The purposes of the questionnaire are to gather feedbacks and opinions about the intervention in relation to the strength and weakness of the guidelines, staff compliance and the interference caused by the emollient therapy to ward routine work. An open-ended question will be included towards the end of questionnaire to allow nurses to give comments.

The evaluation of pilot testing will also include the logistics and staff compliance regarding the application of the emollient therapy and the baby’s skin condition. As a result, the contents of the emollient therapy guidelines will be revised and modified to make it more user-friendly.
CHAPTER 6: EVALUATION PLAN

The purpose of the evaluation plan is to evaluate the effectiveness of the emollient therapy on improving the skin condition of premature babies.

6.1 Target Outcome

6.1.1 Patient outcome

The primary outcome of the new practice is to improve the skin condition of premature babies and to prevent skin breakdown. Skin condition is evaluated in terms of skin score which is a 9-point skin condition grading scale (Darmstadt et al., 2007; Lane & Drost, 1993; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008; Pabst et al., 1999). The scale from 0 to 9 indicates different skin condition in which 0 is normal skin and 9 represents severe dermatitis. The lower score the score, the better the skin. Three skin scores will be collected from each premature baby. Skin score will be recorded on three time points: the admission day, first week of applying the emollient therapy and two weeks after applying the emollient therapy. The primary outcome is achieved if the second and third skin scores are lower than the first skin score.

6.1.2 Healthcare Provider outcome
The outcome for healthcare providers is to develop job satisfaction from the implementation of the innovation. The job satisfaction level and confidence in carrying out the new intervention will be assessed by satisfaction level survey (Appendix H). The emollient therapy is beneficial to premature babies. Staff should feel happy and satisfied to see the babies’ skin condition is improving. The outcome for health care providers is achieved if they choose “agree” or “strongly agree” in overall satisfaction in the said questionnaires.

6.2 Nature and number of clients to be involved

6.2.1 Nature of clients

The premature babies whose gestations are 28-32 weeks and body weight are greater than 1200g will be involved in the intervention. They should be physically stable with no congenital abnormality and no skin diseases.

6.2.2 Number of clients

The sample size can be calculated by using the program “Russ Lenth’s power and sample size” for one sample t-test. The skin condition is graded by skin condition score which is measured before and after the emollient therapy. One-sample t-test was used because it tests the difference between the average
pre- and post-test scores for a single group of people.

The major outcome in the intervention is to lower the skin condition score, which means the improvement of skin conditions. In the article of Lane & Drost (1993), the mean pre-test skin scores on hand and abdomen are 0.47 and 0.33 respectively. After 7 to 11 days of intervention, the mean skin scores on hand and abdomen are 0.12 and 0.07 respectively. The median effect size is 0.5 because a small difference between groups was found. With alpha value significant level of 0.05, the power of 80% and the sigma of 1, we find the sample size is 33. We predict that there is approximately 15% loss of participants due to transferring out or changing in medical condition (Darmstadt et al., 2005). 40 samples will be recruited finally.

6.3 Deciding when and how often to take measurement

The skin condition is rated according to the skin condition grading scale (Appendix I).

Several areas will be assessed: hand, abdomen and foot. These three areas were chosen with reference to literatures (Lane & Drost, 1993). The skin score assessment form is attached in appendix J. The first skin assessment will be carried out upon admission follow by the commencement of the emollient therapy.
The second skin assessment will be taken one week after the commencement of the emollient therapy. The third skin assessment will be taken two weeks after the commencement of the emollient therapy. Exact dates for the second and third skin assessment will be calculated with reference to the date of the first skin assessment. The duration of skin assessment is 2 weeks only. This is because further assessment after 2 weeks may not see significant changes. The skin assessment stops but the emollient therapy will be continued until the patient is transferred out or discharged. (Darmstadt et al., 2007; Nopper et al., 1996; Kohlendorfer, Berger & Inzinger, 2008)

6.4 Specifying how the data will be analyzed

6.4.1 Patient outcome: improving skin condition of premature babies

Patient outcome is to determine whether the skin condition has improved since the implementation of emollient therapy. Therefore, a one sample t-test is used to examine the difference of skin scores before and after the emollient therapy. The SPSS statistical software will be used for one sample t test. The first skin condition score is measured during admission (day 0). Then the second and last skin score are obtained on day 7 and day 14. The mean skin score will be calculated for comparing with the baseline skin score.
6.5 Criteria for effectiveness

The guidelines are effective when the skin condition of premature babies is improved after the emollient therapy. It can be shown by the skin score. After comparing the first and mean skin score of second and third score, we can conclude the new guidelines are effective if there is a decreasing trend in the skin score.

The positive perception of nursing staff towards the new guidelines can also be considered as a benchmark of effectiveness. The job satisfaction and confidence level of frontline staff members are taken into account to determine whether the new guidelines are effective or not. If 80% of frontline staff members show “strongly agree” or “agree” on overall satisfaction and confidence level, the innovation is very likely to be carried out more effectively.

6.6 Conclusion

Evidence from literatures proved that emollient therapy is effective in improving premature infants’ skin. Some emollients input extra benefits on premature infants. This is safe and simple nursing care practice yet rewarding with great outcome. With stronger skin integrity, the physical condition of premature babies can be improved and infection was prevented. In addition, it
helps to shorten the length of hospital stay and increase the mother-infant bonding. With summary and synthesis of data from 7 literates, framework for implementing an emollient therapy guideline is made. When implementing new guidelines, it takes time for frontline staff members to incorporate the new changes into their daily practice. Good communication is essential to make sure the new guidelines work smoothly in clinical setting. Pilot testing is also an important step because it exposes the potential difficulties and challenges so that we can tackle them before the implementation. At the end, a good evaluation plan will help evaluate the outcome and cause better planning in the future.
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## Appendix A

### Search Strategies

#### Keywords

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<td>Finalized identified studies</td>
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- Duplication
Appendix B: Table of evidence

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<th>Comparison</th>
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<td>NICU Babies</td>
<td>Sunflower seed oil therapy 3 times daily for 14 days then twice daily until 28 days or till discharge (n=51)</td>
<td>Standard skin care, no use of topical ointment (n=52)</td>
<td>Day 0 or within 48 hrs 3,7,14,21,28 and until NICU discharge</td>
<td>1 Infection shown in CSF and blood culture (%)</td>
<td>1. Incident of infection was significantly reduced in SSO than control (P=0.007) 2. Score in control gp increased rapidly than in SSO gp in first 28 days (P=0.037) 3. Not significantly different (P=0.3)</td>
</tr>
</tbody>
</table>

- NICU Babies - <34 weeks gestational age (mean =31.3 in SSO, 31.6 in control) - Mean body weight (1583g in control, 1459g in SSO) - <72 hours old - No congenital abnormality

- CSF: cerebral spinal fluid


<table>
<thead>
<tr>
<th>Bibliographic citation</th>
<th>Study type (lev of ev)</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>Darmstadt et al. (2007).</td>
<td>RCT (+)</td>
<td>Preterm neonates</td>
<td>1. Apply sunflower seed oil (n=252) or 2. apply aquaphor ointment (n =159)</td>
<td>-Standard skin care without emollient or other protective skin measures (n=213)</td>
<td>Skin condition assessed on day 3, 7, 14, 21 and 28 until discharge</td>
<td>1. Skin condition (9 point scale, lower the score, better the skin)</td>
<td>In 14 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Special care nursery</td>
<td>- 3 times daily for 14 days then twice daily until discharge</td>
<td>-Same general care</td>
<td></td>
<td>2. Blood-skin pairs culture positive rate (%) (Both skin and blood culture matched with same pathogen)</td>
<td>1. Lower skin score (Better skin condition) in SSO or aquaphor gp than control SSO (p&lt;0.01); Aqu (p&lt;0.01)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Body weight &lt;1250g (n=225) and &gt;1250g (n=270)</td>
<td>Apply to entire body surface except scalp, face and IV site</td>
<td></td>
<td></td>
<td>3. Skin colonization (axilla/umbilical/inguinal)</td>
<td>2. SSO reduces entry if skin pathogen into blood, though not significant. (3.2%, p&lt;0.01, $X^2$ test); instead SSO treatment reduced incidence of nosocomial infection originating from other sites other than skin.(24.6%, p&lt;0.01, $X^2$ test) ; aquaphor with similar result as SSO but less effective (3.1%, p&lt;0.01; 22%, p&lt;0.01, $X^2$ test)</td>
</tr>
</tbody>
</table>
3. **SSO**: not effective in reducing colonization rate
   Aqu: reduce colonization rate in axilla and umbilical sites only in Day1 baseline sample (p<0.05, test/ x2 test)


<table>
<thead>
<tr>
<th>Bibliographic citation</th>
<th>Study type</th>
<th>Patient characteristics</th>
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<th>Comparison</th>
<th>Length of Follow up</th>
<th>Outcome measures</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane &amp; Drost (1993) RCT (++)</td>
<td>- Premature babies between 29-36 gestation age. Mean: 32.3 week in treatment gp and 32.5 weeks in control gp - Stay in NICU at least 1 week - Admitted to NICU for respiratory distress and sepsis</td>
<td>-thin coat of water-in-oil emollient cream (Eucerin crème) on body - applied twice a day for maximum 16 days or until discharge before 16th day (n=17) -apply to entire body except face and scalp</td>
<td>-Routine skin care without topical emollients. (n=17)</td>
<td>Monitor twice a week and maximum 16 days - Skin condition of hand, feet and abdomen - Fungal culture and quantitative bacterial cultures from axilla and abdomen</td>
<td>- Skin condition (9-point grading scale); perform 8-10 hours after emollients. - Transdermal water loss (TEWL) (before study, only 8 neonates evaluated; after study 9 in treated, 11 in control were evaluated) - Fungal culture and quantitative bacterial cultures from axilla and abdomen (no of bacteria</td>
<td>- Treated group is significantly lower skin score and decreased in dermatitis than control in day 7-11 (p=0.0021) - TEWL of abdomen and thigh decreased after applying emollients but no statistically difference between groups - No statistically difference</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bibliographic citation</th>
<th>Study type</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>Darmstadt et al. (2005)</td>
<td>RCT (+)</td>
<td>Preterm newborn &lt;33 weeks gestation, mean 31.3 in both SSO and Aquaphor gp and 31.1 in control gp  - BW 1230g in SSO, 1232g in Aquaphor and 1201 g in control gp  - &lt;72h old, survival within 48h, no major abnormality and surgical procedures required, no skin infection or generalized skin disease, no structural problem affecting more than 5%</td>
<td>Apply sunflower seed oil (n=159 ) or Aquaphor (n=157) to entire body except face and scalp 3 times daily in first 14 days and 2 times daily until discharge  - SSO kept in refrigerated stock container and put at bedside and change every 2-3 days  - 4g of emollient per kg body weight per treatment  - Sterile procedure</td>
<td>Standard care without use of topical emollients or other measure to prevent skin breakdown or improve skin barrier function (n=181)</td>
<td>Blood culture taken within first 48h and taken whenever infection noted as shown by clinical signs. Take CSF if severe infection noted.</td>
<td>- Nosocomial infection (n)</td>
<td>- Nosocomial infection rate reduced significantly in sunflower seed oil when compared with control. (p= 0.032), reduced but not significant in aquaphor group when compared with control Sunflower (p=0.025) and aquaphor (p=0.014) significantly reduced infection for patient weighed less than 1250g.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bibliographic citation</th>
<th>Study type</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>Nopper et al. (1996)</td>
<td>RCT (-)</td>
<td>Newborns &lt;33 gestational age, enrolled within first 96 hours after birth - Mean gestational age: 29.3+/-2.3 in treatment and 29.1+/-2.4 in control - BW range 1237+/-362g in treatment and 1231+/- 443g in control group - In NICU</td>
<td>Q12H daily for 2 weeks receiving Aquaphor the preservative-free topical ointment (n=30) - use 1.5ml of ointment in sterile syringe - apply to entire body except face and scalp</td>
<td>Received routine skin care without emollient (n=30)</td>
<td>Whole period was 2 weeks. On day 0,2,3,4, days 7 and 14 - TEWL and skin condition were measured (dorsal aspect of both left and right forearms and lateral aspect of calf and both side of trunk.; measured 10-12 hours after applying - Fungal and quantitative bacterial cultures were done</td>
<td>1. Tran dermal water loss measurement (TEWL) (%) 2. Skin condition scores (score 1-9, 1 is normal skin without dryness, 9 is indicative of severe dermatitis) 3. Fungal and quantitative bacterial skin cultures 4. Incidence of blood and CSF cultures positive for microorganisms (%) 5. Fluid requirement</td>
<td>1. On day 0 compared with before and after 60min of emollient, the TWEL was reduced significantly (p=0.0001). On day 14, the treated gp reduced TEWL significantly (p=0.04) 2. Superior skin condition scores on day 7 and 14 (p= 0.001 and 0.0004) 3. Less colonization of axilla on day 2, 3 or 4 and on day 14 (p=0.008 and 0.04)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bibliographic citation</th>
<th>Study type (lev of confidence)</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>Kohlendorfer, Berger &amp; Inzinger (2008)</td>
<td>RCT (+)</td>
<td>Infants admitted to NICU between 25-36 weeks of gestation.</td>
<td>Group A (water-in-oil emollient cream-Bepanthen) (n=57)</td>
<td>Group C (control group without any topical skin therapy or any measures to prevent skin breakdown or modulate skin barrier function) (n=58)</td>
<td>Maximum of 4 weeks in NICU or until day 28 if infants were transferred out in intermediate care unit.</td>
<td>Primary: Skin condition score at a 4-point scale (1 is best, 4 is worst)</td>
<td>Significant effects of treatment groups than control groups after week 2. (p&lt;0.001)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Survive in 48hours after birth</td>
<td>Group B (nature Olive oil cream with 30% olive oil &amp;70% lanoline) (n=58)</td>
<td></td>
<td></td>
<td>Secondary: Occurrence of dermatitis</td>
<td>Most pronounced results at week 3 and 4 (p&lt;0.001)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean gestational age and BW: 30.3 and 1508g in Bepanthen gp, 30.4 and 1581g in olive g p and 30.5 and</td>
<td>Applied cream twice a day and maximum</td>
<td></td>
<td></td>
<td>Secondary: Olive oil cream was superior to water-in-oil emollient cream</td>
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</tr>
</tbody>
</table>

- Patterns of weight loss and gain
- Incidence of positive blood or CSF culture significantly less in treatment group (p=0.02)
- No statistically difference in fluid requirement and weight gain or loss
1556g in control gp
- No life threatening abnormality or skin disease
- To entire body except face and scalp
- Continue to follower before day 28 if infants were transferred to intermediate care unit
and 4

Topical treatment (both water-in-oil emollient and olive oil cream) effectively decreases the risk of dermatitis.


<table>
<thead>
<tr>
<th>Bibliographic citation</th>
<th>Study type</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>Pabst et al. (1999) RCT (++)</td>
<td>NICU Infants of 26-30 gestational age&lt;br&gt;Gestational age in Aquaphor: 28.3+/-1.4wk and 27.5+/-1.3wk in control&lt;br&gt;BW 1143+/-175g in control</td>
<td>Received 1.5ml of aquaphor applied to whole body except face and scalp&lt;br&gt;Applied twice daily for 14 days (n=11)</td>
<td>Routine skin care included soap and water bath plus plain sterile water bath. Use of lotion and cream was avoided. (n=8)</td>
<td>14 days&lt;br&gt;Skin condition was assessed at enrollment and twice a week, total 5 times</td>
<td>Skin condition score (0-9) (perform 8-10 hours after application of ointment); only view, not touch&lt;br&gt;Assess 8-10 hours after application</td>
<td>Skin condition in treated group is significantly better than control (p&lt;0.002); significant worsening in control group over time (p&lt;0.012). Not change over 2 weeks.</td>
<td>-Skin condition in treated group is significantly better than control (p&lt;0.002); significant worsening in control group over time (p&lt;0.012). Not change over 2 weeks.</td>
</tr>
</tbody>
</table>
aquaphor and 1011+/-338g in control
- <24 hours old

- (reduce greasy appearance to make the treatment gp remained blinded)

- No significant differences between the control and treated groups as quantitative bacterial counts increased over time

fluid requirement.
### SIGN Methodology Checklist 2: Controlled Trials

#### Section 1: Internal validity

<table>
<thead>
<tr>
<th>In a well conducted RCT study…</th>
<th>In this study this criterion is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 The study addresses an appropriate and clearly focused question.</td>
<td>Well covered</td>
</tr>
<tr>
<td></td>
<td>Adequately addressed</td>
</tr>
<tr>
<td></td>
<td>Poorly addressed</td>
</tr>
<tr>
<td>1.2 The assignment of subjects to treatment groups is randomised</td>
<td>Well covered</td>
</tr>
<tr>
<td></td>
<td>Adequately addressed</td>
</tr>
<tr>
<td></td>
<td>Poorly addressed</td>
</tr>
<tr>
<td>1.3 <em>An adequate concealment method is used</em></td>
<td>Well covered</td>
</tr>
<tr>
<td></td>
<td>Adequately addressed</td>
</tr>
<tr>
<td></td>
<td>Poorly addressed</td>
</tr>
<tr>
<td>1.4 Subjects and investigators are kept ‘blind’ about treatment allocation</td>
<td>Well covered</td>
</tr>
<tr>
<td></td>
<td>Adequately addressed</td>
</tr>
<tr>
<td></td>
<td>Poorly addressed</td>
</tr>
<tr>
<td>1.5 The treatment and control groups are similar at the start of the trial</td>
<td>Well covered</td>
</tr>
<tr>
<td></td>
<td>Adequately addressed</td>
</tr>
<tr>
<td></td>
<td>Poorly addressed</td>
</tr>
<tr>
<td>1.6 The only difference between groups is the treatment under investigation</td>
<td>Well covered</td>
</tr>
<tr>
<td></td>
<td>Adequately addressed</td>
</tr>
<tr>
<td></td>
<td>Poorly addressed</td>
</tr>
<tr>
<td>1.7 All relevant outcomes are measured in a standard, valid and reliable way</td>
<td>Well covered</td>
</tr>
<tr>
<td></td>
<td>Adequately addressed</td>
</tr>
<tr>
<td></td>
<td>Poorly addressed</td>
</tr>
<tr>
<td>1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study</td>
<td>Well covered</td>
</tr>
<tr>
<td></td>
<td>Adequately addressed</td>
</tr>
<tr>
<td></td>
<td>Poorly addressed</td>
</tr>
<tr>
<td>1.9</td>
<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis)</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites</td>
</tr>
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</tbody>
</table>

### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

| 2.1 | How well was the study done to minimise bias? Code ++, +, or − |
|---|---|---|---|---|---|---|---|---|
| 1.1 | The study addresses an appropriate and clearly focused question. | Adequately addressed | Well covered | Adequately addressed | Adequately addressed | Adequately addressed | Adequately addressed | Adequately addressed |
| 1.2 | The assignment of subject to treatment groups is randomized | Poorly addressed | Poorly addressed | Adequately addressed | Well covered | Adequately addressed | Adequately addressed | Adequately addressed |
| 1.3 | An adequate concealment method is used | Not addressed | Not addressed | Not addressed | Adequately addressed | Not addressed | Not addressed | Not addressed |
| 1.4 | Subjects and investigators are kept “blind” about treatment allocation | Not addressed | Adequately addressed | Well covered | Adequately addressed | Not reported | Adequately addressed | Well covered |
| 1.5 | The treatment and control groups are similar at the start of the trial | Well covered | Well covered | Well covered | Well covered | Well covered | Well covered |
| 1.6 | The only difference between groups is the treatment under investigation | Adequately addressed | Adequately addressed | Adequately addressed | Well covered | Adequately addressed | Adequately addressed | Well covered |
| 1.7 | All relevant outcomes are measured in a standard, valid and reliable way | Adequately addressed | Adequately addressed | Adequately addressed | Well covered | Well covered | Well covered | Well covered |
| 1.8 | What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed? | 0% | 0% | 0% | Not reported | Not reported | Not reported | 0% |
| 1.9 | All the subjects are analyzed in the groups to which they were randomly allocated (often referred to as intention to treat analysis) | Not applicable | Not applicable | No applicable | Adequately addressed | Adequately addressed | Adequately addressed | Adequately addressed |
| 1.10 | Where the study is carried out at more than one site, results are comparable of all sites | Adequately addressed | Not applicable | Not applicable | Adequately addressed | Not applicable | Adequately addressed | Not applicable |
2.1 | How well was the study done to minimize bias? Code ++, + or - |
<table>
<thead>
<tr>
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<td>-</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>++</td>
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</table>
Appendix E

Cost and expenditure table

### Material cost in one day per case

<table>
<thead>
<tr>
<th>Items</th>
<th>Price per unit</th>
<th>calculation</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emollient</td>
<td>$0.238/ml</td>
<td>$0.238 x 1.5 x 2</td>
<td>$0.714</td>
</tr>
<tr>
<td>Bottle</td>
<td>$0.5</td>
<td>$0.5 x 1/2</td>
<td>$0.25</td>
</tr>
<tr>
<td>paper</td>
<td>$0.01/sheet</td>
<td>$0.01 x 2</td>
<td>$0.02</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td></td>
<td></td>
<td><strong>$0.984</strong></td>
</tr>
</tbody>
</table>

### Material cost corresponds to average NICU admission in one month

<table>
<thead>
<tr>
<th>Items</th>
<th>Price per unit</th>
<th>calculation</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>One month expense</td>
<td>$0.984/case</td>
<td>$0.984 x 8.3 cases x 14 days</td>
<td>$114.34</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td></td>
<td></td>
<td><strong>$114.34</strong></td>
</tr>
</tbody>
</table>

### Material cost for pilot testing in two months

<table>
<thead>
<tr>
<th>Items</th>
<th>Price per unit</th>
<th>calculation</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two months expense</td>
<td>$114.3</td>
<td>$114.34 x 2</td>
<td>$228.7</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td></td>
<td></td>
<td><strong>$228.7</strong></td>
</tr>
</tbody>
</table>

### Material cost for emollient therapy in a year

<table>
<thead>
<tr>
<th>Items</th>
<th>Price per unit</th>
<th>calculation</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>One year expense</td>
<td>$114.34</td>
<td>$114.34 x 12</td>
<td>$1372.1</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td></td>
<td></td>
<td><strong>$1372.1</strong></td>
</tr>
</tbody>
</table>

### Evaluation after pilot testing

<table>
<thead>
<tr>
<th>Items</th>
<th>Price per unit</th>
<th>calculation</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff</td>
<td>$191/hr</td>
<td>191 x 3 ppl x 2 hrs</td>
<td>$1146</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td></td>
<td></td>
<td><strong>1146</strong></td>
</tr>
</tbody>
</table>

Total expenditure to start emollient therapy in first year (2 months pilot test + 12 months intervention):

$228.7 + 1372.1 + 1146 = $2746.8
Appendix F
Briefing sessions

Date: 1/2, 3/2, 5/2, 8/2, 10/2 (tentative dates, one month before pilot testing)
Venue: Conference room
Duration: 30 minutes
Media: Powerpoint

Rundown
1. Briefing of the flow of innovation
   - Showing emollient therapy information sheet
   - Explain timeframe of 2 weeks pilot testing and 1 year innovation
2. Explain the rationale of applying emollient therapy
   - Showing some statistics and literature reviews
   - Distributing sample of neonatal skin condition score chart
3. Explain the details of emollient therapy
   - Target population
   - Type of emollient use
   - When to start
   - Where to apply
   - Frequency of application
   - Amount of emollient needed
   - Storage method
   - Duration of therapy
   - Time of termination
4. Explain the change of ward practice
   - Signing on in “nursing prescription chart” to start emollient therapy
   - Scheduling time (am and pm shift)
   - To be signed by case nurse when it is done
   - Signing off if
     ◆ Finishing 2 weeks of application
     ◆ Being discharged within two weeks
     ◆ Medical condition deteriorates
5. Debriefing
   - Encouraging staff to do emollient therapy for babies
6. Question and answer session
Appendix G

Questionnaire on emollient therapy for nursing staff (pilot testing)

<table>
<thead>
<tr>
<th>Please choose the best answer on the right side</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The emollient therapy is easy to apply</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. Applying the emollient will not increase any workload</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>3. Applying the emollient is not time consuming</td>
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<tr>
<td>4. The guideline is easy to follow</td>
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</tr>
<tr>
<td>5. Overall, I am satisfied with the emollient therapy</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Any other comment on this emollient therapy?
   _____________________________________________________________
Appendix H
Questionnaire (For frontline staff)

**Satisfaction level**

<table>
<thead>
<tr>
<th>Please choose the best answer on the right side</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. The information in briefing session is clear for carrying out the intervention</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8. The length of briefing session is appropriate</td>
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</tr>
<tr>
<td>9. The emollient therapy is suitable for premature babies.</td>
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</tr>
<tr>
<td>10. Applying the emollient will not increase any workload</td>
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</tr>
<tr>
<td>11. I applying the emollient is not time consuming</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>12. The guideline is easy to follow</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>13. Overall, I am satisfied with the emollient therapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Any other comment on this emollient therapy?</td>
<td>____________________________________________________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Confidence level**

<table>
<thead>
<tr>
<th>Please choose the best answer on the right side</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. You are confident enough to apply emollient therapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. You are able to handle emollient therapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>17. Overall, you are confident enough to carry out the new practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Any suggestion to the new intervention?</td>
<td>____________________________________________________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix I

<table>
<thead>
<tr>
<th></th>
<th>Skin Condition Grading Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.</td>
<td>Normal, no sign of dry skin</td>
</tr>
<tr>
<td>1.</td>
<td>Dry skin with few visible scales</td>
</tr>
<tr>
<td>2.</td>
<td>Dry skin with moderate visible scales</td>
</tr>
<tr>
<td>3.</td>
<td>Dry skin with many visible scales</td>
</tr>
<tr>
<td>4.</td>
<td>Dry skin with thicker, darker scales and areas of mild erythema</td>
</tr>
<tr>
<td>5.</td>
<td>Dry skin with thicker, darker scales, increased areas of mild erythema, and skin has a rough texture</td>
</tr>
<tr>
<td>6.</td>
<td>Dry skin with thicker, darker scales, increased areas of mild erythema, skin has a rough texture, and superficial fissures are seen</td>
</tr>
<tr>
<td>7.</td>
<td>Dry skin with thicker, darker scales, increased areas of mild erythema, and skin has a rough texture with deeper fissures</td>
</tr>
<tr>
<td>8.</td>
<td>Dry, crusted skin on erythematous base with dark scales, fissures, and occasional areas of erythematous, crusting, oozing skin</td>
</tr>
<tr>
<td>9.</td>
<td>Erythematous, crusting, oozing skin involving the entire area</td>
</tr>
</tbody>
</table>

Appendix J

Skin condition assessment form (weekly)

<table>
<thead>
<tr>
<th>Skin condition score on</th>
<th>Date (Day0)</th>
<th>Date (Day7)</th>
<th>Date (Day14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>abdomen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>remark</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 1. Skin Condition Grading Scale**

0. Normal, no sign of dry skin  
1. Dry skin with few visible scales  
2. Dry skin with moderate visible scales  
3. Dry skin with many visible scales  
4. Dry skin with thicker, darker scales and areas of mild erythema  
5. Dry skin with thicker, darker scales, increased areas of mild erythema, and skin has a rough texture  
6. Dry skin with thicker, darker scales, increased areas of mild erythema, skin has a rough texture, and superficial fissures are seen  
7. Dry skin with thicker, darker scales, increased areas of mild erythema, and skin has a rough texture with deeper fissures  
8. Dry, crusted skin on erythematous base with dark scales, fissures, and occasional areas of erythematous, crusting, oozing skin  
9. Erythematous, crusting, oozing skin involving the entire area
Appendix K
Abbreviations

BW- Birth Weight
CSF – Cerebral Spinal fluid
Gp – group
Hr- hour
IV – intravenous
NICU- Neonatal Intensive Care Unit
Ppl - people
Q12H – Every 12 hours
RCT - Randomised Control Trial
SSO – Sunflower Seed Oil
TWEL- Transdermal water loss