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The Practice of Newborn Bathing

by

Jennifer Mary Medves ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfilment of the requirements for the degree of Doctor of Philosophy

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The First Bath

The child's face is first gently washed on the nurse's lap without soap. Its head, limbs, and body are then lathered with soap, and it is lifted into the bath, its head resting on the nurse's wrist, her thumb and forefinger round its neck, the other fingers supporting its back, her right hand grasping its legs. While it is being quickly sponged the nurse supports its head and back, its body resting on the bottom of the bath. It is lifted out in the same way and placed on a warm towel on the nurse's lap. The whole process of washing, drying, and dressing should be carried out very quickly and deftly, with no abrupt or sharp movements, but skilful (sic) rapidity, as a newborn infant is easily chilled. (Silver, 1905, p. 333)

University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled The Practice of Newborn Bathing submitted by Jennifer Mary Medves in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Dedication

Dedicated to my husband Jay Stuart Medves and to my friends Judy and Tom Mill without whose support throughout the last four years none of this work would have been possible.

Abstract

Maternal child nursing practice has evolved from adherence to standardized care plans to searching for evidence to validate nursing practice. Evidence is required to evaluate the risks and benefits of procedures that health care professionals perform in daily practice. One hundred and forty well term infants were randomized in a clinical trial comparing the benefits of cleanliness to the risk of causing hypothermia as a result of the first bath.

There was no difference in temperature change between infants bathed by a nurse or infants bathed by a parent ($F = 0.595$, $df = 1$, $p = 0.442$). There was no difference between groups in the quantity of microbes found on skin swabs at either the umbilicus or anterior fontanelle. There was no difference between groups in the type of microbes found on the skin at either site (Kruskal Wallis ranged from χ^2 2.081, df 1, $p = 0.149$ to χ^2 0.121, df 1, $p = 0.728$). There was insufficient agreement between temperatures obtained by using axilla thermometers and an aural probe prior to the bath (Intraclass Correlation Coefficient [ICC} 0.68). Temperatures obtained one hour after the bath agreed more closely (ICC 0.84).

Analysis of the data determined that risking the thermal stability of infants does not clearly out weigh the benefits of bathing. Skin colonization is unaffected by bathing. Study results showed that the heat loss experienced by infants during bathing is independent of the bather. Soap made no difference to the natural acquisition of normal skin flora compared to infants who were not bathed in soap. With maternity stays of less than 24 hours, infant bathing may best be carried out in the home following discharge, or if in hospital by parents with support from nurses.

The use of aural thermometers to assess newborn temperatures requires further evaluation in settings other than the nursery under radiant heaters. Temperatures obtained by aural thermometers should be used cautiously when assessing fever in young infants. Health care professionals need to remain vigilant about newborn thermal stability during adaptation to extrauterine life, and measures should be taken to prevent both hyper and hypothermia.

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Many people have guided me through graduate degree and for their help I am eternally grateful. Dr. B. O'Brien has been my supervisor for four and a half years and has provided me with a perspective on birthing families to which I will use in all my future research studies. Dr. Field and Dr. Rennie have given me valuable insight into maternal child health, microbiology, and graduate education. The members of the class of 1996 are at different stages in their doctoral work at this time but all have contributed information, kindness and support at times to me during the last four years. In particular I would like to thank Judy Mill, Karen Benzies, Virginia Richardson, Marilyn Evans, and Lela Zimmer.

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Rosalie Zinner, Christopher Duddeck, and Corinne Duhlberg provided help when needed in data collection, data management and analysis which gave me a boost towards completing the project in a timely manner and feeling confident that I had interpreted data correctly.

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CHAPTER ONE

The Practice of Bathing Newborns

In many Canadian hospitals newborn infants are bathed within the first few hours of birth to remove liquor, blood, and other birthing fluids. When Labour, Delivery, Recovery, and Postpartum Rooms, (LDRPs) are not available, this procedure often takes place in an admission nursery with only the father or neither of the parents present. Bathing may cause transient hypothermia and discomfort for the infant with subsequent risk of hypoglycaemia in susceptible infants. Following the bath, infants are dressed and bundled in blankets or placed under a radiant heater with a temperature probe attached until the body temperature is assessed as stable. When the temperature is stable the infant is returned to the family.

Separation of mother and infant in the first few hours after birth has been questioned and it is recommended that any separation be avoided (Daughtry, 1996; Moxley, Avni, Brydon, & Kennedy, 1998; Waldenström, & Swenson, 1991). When compared to infants who are separated, infants who remain with their mother cry and startle less frequently (Anderson, 1989). An infant, lying in a cot away from the mother's bedside, gave oral cues demanding feeding for half an hour before crying (Gill, White, & Anderson, 1984), and infants who remained with mothers overnight cried less than those in the nursery, 0.6% as compared to 7.5% of the total observed time of the study (Keefe, 1987). Mothers are able to prepare for breast feeding as soon as their infant stirs, while those infants in nurseries are often very stressed by the time they are reunited with their mothers. Persuading a crying infant to latch is more difficult than one who is stirring from sleep (Moxley et al., 1998). The physiological response that facilitates maternal letdown when a mother hears her infant crying is diminished.

Bathing has been thought to enhance the newborn appearance, remove infectious organisms, and promote cleanliness (Marbut & Loan, 1996; Peters, 1996) although transfer of infectious organisms through contact with the skin of a newborn has not been established. The risk of cross infection among healthy term infants is considered minimal due to short length of hospital stay and 'rooming in' practices. 'Rooming in' is associated with lower colonization rates of Staphylococcus aureus (S. aureus) and the incidence of newborn rash (Rush, 1986). S. aureus was the organism most often associated with nosocomial infections in nurseries. Discharge from hospital to home without contact with other infants minimizes the risk of newborn infection (Elias-Jones, Gordon, & Whittaker, 1961).

The Centers for Disease Control in Atlanta (1988) recommend universal precautions to protect health care workers from exposure to contaminated blood and body fluid. The recommendations were made, in part, because of recognition that health care workers may contract life threatening diseases such as hepatitis B and human immunodeficiency virus (HIV) through their employment. While hepatitis B vaccine is provided for those who work in high risk areas such as maternity units, there is no vaccine for HIV. The extent that infants may infect nurses is unknown. The danger of cross infection has been raised in the 1980s and 1990s as an issue. Nurses adhering to universal precautions wear gloves when in contact with any bodily fluids, including amniotic fluid.

The practice of admitting infants to a newborn nursery for observation and bathing immediately following birth is questionable because there is lack of scientific evidence that observation and bathing will reduce infant morbidity and the risk of transmitting infectious organisms to nursing staff and other infants. There is an economic concern about this nursing procedure because additional nursing staff are needed if all infants are routinely admitted to a newborn nursery for bathing. Current practice is to invite fathers to witness infant bathing in the newborn admission nursery. An important next step is to encourage both mother or father to participate in bathing their newborn.

Demonstration baths in maternity units may leave new mothers feeling inadequate if they are led to believe that unless they follow a careful protocol they will somehow harm their infant (Thomas, 1995). Infants have been found to be unnecessarily exposed to cold stress (Brennan, 1996; Thomas, 1995). Nurses and midwives have produced many rules for infant bathing such as one piece of cotton wool for one eye, another one for the other eye, so mothers were often frightened to bath their infants in case they made a mistake (Brennan, 1996). Bathing is so natural that mothers can be supported in finding a way that works well for them (Thomas, 1995).

The choice of soap for the first bath has been influenced by concerns about cross infection. Antibacterial soaps were deemed necessary to prevent outbreaks of S. aureus infections. With shorter stays in hospital and the decrease of outbreaks of infection the practice of antibacterial baths has ceased in most institutions, instead mild soaps are widely used. The extent to which mild soap actually reduces the rate of colonization of skin organisms when compared to water or not bathing is not known.

Birthing families spend very short periods of time in hospital and the opportunity for teaching infant care at the bedside is lost if the infant is removed from the room. Leaders in maternity care are embracing the concept of combined care in labour, delivery, recovery, and postpartum care (LDRP) rooms. A priority for maternal child nurses is to promote family-centred care. If mothers and infants are together 1) opportunities for healthy attachment are maximized; 2) the family can participate in care; and 3) an environment for breast feeding is created (Hanvey, Avard, Graham, Underwood, Campbell, & Kelly, 1994). Elias-Jones and colleagues (1961) were among the first to question the necessity for admitting all newborns to hospital nurseries and yet we are only in the 1990's fully embracing the concept of LDRP's and combined care. With these concepts is the expectation that the mother and infant dyad will not be separated and that health care professionals will provide assessment, care and support to the dyad rather than to the mother and infant individually.

Within combined care maternity nurses will be required to provide all infant care at the bedside. However, teaching rather than 'doing to' or 'doing for' will be the nursing focus. Mothers and their families will participate in care, including infant bathing (Anderson, Lane, & Chang, 1995; Crystle et al., 1980; Marbut & Loan, 1996; Nelson et al., 1980). Anderson and colleagues demonstrated that infants can safely be bathed at the bedside when nurses bathed the infants. The next step is to ascertain if it is safe for parents rather than caregivers to bathe infants. Thermal stability during the bath will affect infant well being. Health professionals recognize that infants are at risk from cold stress (World Health Organisation, 1993).

It is not known if the bath decreases the risk of cross infection of potential pathogens or how the bath affects the newborn. It is also not known if the location of the bath influences these parameters. There is an opportunity with bedside parental bathing for the infant to be placed skin to skin immediately after the bath for interaction and generalized warming (Anderson, Lane, &Chang, 1995).

In order to study the effect of bathing on thermal stability and bacterial colonization of the skin of new born infants, a randomised clinical trial was conducted, to compare the temperature changes experienced by the infant when bathed by either a parent or a nurse, and the incidence and number of organisms of normal skin flora and potential pathogens between infants bathed with or without soap. The research questions for the study were:

1) Is there a difference in temperature change during bathing when infants were bathed by either parent as compared to when and an infant was bathed by a health care professional ?

2) Does the use of mild soap rather than water alone affect the process of skin colonization over the first 24 hours of life?

The same infants participated in both aspects of the study because there should be no interaction between skin colonization and temperature change during bathing. The effect of soap compared to water on skin colonization was analysed and reported separately from the effect on newborn temperature during bathing by either a parent or the nurse in the newborn nursery.

The infants were randomised to one of four groups, half were bathed in water alone (Groups 1 and 3), and half were bathed with a mild pH neutral soap (Groups 2 and 4). Half were bathed by one or other parent as designated by the mother (Groups 1 and 2) and the other half were bathed in the admission nursery by a nurse (standard maternity care) (Groups 3 and 4). The effect on colonization of the skin was assessed with the infants who were bathed in water and compared to the infants who were bathed with a mild soap. The effect of temperature change was compared between the infants bathed by the mother or father and the infants bathed by the admission nursery staff. The design is presented in table 1.

Table 1: Design of randomized clinical trial

Person giving bath	Bathed in Water	Bathed in Mild soap and Water	Number of infants
Mother or Father (Experimental group)	35 (Group 1)	35 (Group 2)	70
Maternity Nurse (Standard Care)	35 (Group 3)	35 (Group 4)	70
Number of infants	70	70	140

Bacterial swabs were taken from two sites (i.e., the anterior fontanelle and the umbilicus) on three occasions (i.e., 1 hour following birth, 1 hour following the bath and 24 hours after birth)(Personal communication, October 1998, Robert Rennie, PhD, Department of Microbiology, University of Alberta Hospital). The times chosen were determined by the average length of stay in hospital. Bacterial colonisation from both sites was compared. All infants had axilla temperatures taken prior to the bath and 1 hour after the bath and aural temperatures taken on five occasions (i.e., prior to the bath, after being undressed, during the bath, after being dried, and 1 hour after the bath). Axilla temperatures are the standard method of assessing temperature in newborns. While aural temperatures are easier and less disruptive the validity and reliability of this measure has not yet been established in newborns. The readings from an aural thermometer and an axilla thermometer were compared in this study, in order to determine the level of agreement between the two temperature methods. Aural temperature readings are quick and easy to obtain and the technology is widely available to the public for use in children.

Operational Definitions

These following definitions were developed for this study:

Newborn Infant Bath

The first bath given to an infant following birth that involves submersion in warm water. The infant is undressed and wrapped in a clean dry towel. The face is washed with clean water and a face cloth. The head is washed with water/soap or water only using the palm of the hand. The infant is then unwrapped from the towel and placed into a deep warm bath with the water temperature at 38° C. The infant is thoroughly washed in soap and water or water alone, removed from the bath, dried, and dressed in appropriate clothing and wrapped in clean dry blankets.

Clinically Important

For a finding to be clinically important the data reported is actually or potentially relevant to clinical practice. A clinically important finding implies that a different procedure or plan may be appropriate in a given setting. The difference between statistical and clinical importance or significance is that many times statistical results may demonstrate signficant differences but are so small they will not affect the clinical practice, procedure, or plans. In health care settings results must be evaluated as clinically important if changes are to be recommended.

Clinically Important Temperature Change

A temperature change of at least 1 degree C from the baseline measure taken prior to the bath with an axilla and an aural thermometer.

Thermal Stability

The range of infant temperature where there is least use of energy to either provide heat or cool the body. The range is 36 to 37.2 degrees centigrade.

Level of Agreement for Interchangeability of Thermometers

A consistent temperature demonstrated using both axilla thermometers and aural probes that is not more than 0.2 degree C different.

Clinically Important Skin Flora Difference

A difference in colonization of at least two categories in the semi-quantification scale (i.e., no growth, scant growth, light growth, moderate growth, and heavy growth).

CHAPTER TWO

Bathing rituals

Bathing has been associated with curing illnesses, cleanliness, and godliness (Adler, 1993) and is a nursing ritual. Bathing clients provides nurses with many opportunities for patient contact (Wolf, 1993) and can be viewed as therapeutic in that nurses assess and monitor the condition of clients while carrying out the bath. Wolf (1993) concludes that the bath,

> represents part of the essential character of nursing and is rooted in the beliefs, art, science; it is a channel for many other nursing activities and responses, and as such, is a necessary part of the professional repertoire of nurses (p.146).

The practice of bathing new infants has become part of the ritual of nursing in maternity units.

Bathing has been considered a cure for a variety of ills since antiquity. Hippocrates (c.460 - 377 BC) described bathing as a remedy for urinary retention (Adler, 1993). Twentieth century researchers demonstrated that immersion in water causes diuresis that persists for two hours (Bazett, 1924). Over the last ten centuries hydrotherapy has been prescribed for excessive oedema, liver ascites, jaundice, mental disorders, rheumatic disorders and palsy (Adler, 1993) and as a comfort strategy for labouring women (Burke & Kilfoyle, 1995; Garland, 1995). Countries that comprised the former Soviet Union, Italy, and France have springs and spas that offer state subsidised and physician prescribed water therapies (Adler, 1993). Water immersion for treatment (i.e., Balneotherapy) is used in Israel to treat rheumatoid arthritis (Sukenik, Neumann, Flusser, Kleiner-Baumgarten, & Buskila, 1995). While physicians in some cultures prescribe baths, it is nurses who bath or assist patients in bathing themselves. Nightingale advocated bathing as a therapy that is an essential component of nursing care (Hecktor & Touhy, 1997). Bathing became and remains a nursing ritual and is one of the first procedures taught to student nurses.

The importance of bathing to nursing is stressed in the following excerpt that outlines the variety of baths provided by nurses (Crawford, 1910). The nurse learns,

> ...to give the full bath, the half bath, the sponge bath, the Russian bath, the sheet bath, the salt bath, the mustard bath, the hot vapour bath, the cold douche, the hot pack, the wet pack, the cold pack - those with various modifications - and the carbonated bath. (p.314)

The salt bath is rarely used in maternity care but was prescribed regularly in the 1980's in the United Kingdom to aid healing of the perineum following birth. The salt bath was finally abandoned when it was discovered that a full tub of water with half a cup of salt added was really not worth the effort because the degree of salination was negligible (Sleep, 1990). In Canada, sitz baths are prescribed frequently with or without the use of heat lamps or hair dryers to promote perineal healing. The efficacy of both of these practices requires evaluation (Sleep, 1990). Warm baths are advocated for post surgical patients and birthing women who are having difficulty voiding.

Ritualistic bathing is a part of many societies. The ancient Greeks and Romans left behind lavish facilities from which we have been able to extrapolate how the bath was an integral part of their daily living. Bathing involved soaping down, dipping into baths of different temperatures, and finishing with massages (Adler, 1993). Keeping clean by bathing daily went out of fashion in western Europe from the time of the collapse of the Roman Empire until the Industrial Age. Hektor and Touhy (1997) maintain that cleanliness was a great equalizer of the poor and middle classes with the clean people making up the newly emerging democratic classless societies. Nineteenth century school children were taught to wash regularly (Adler, 1993). Hektor and Touhy (1997) describe the ritual of bathing before admission to an institution, which became the pre operation bath. Skin was scrubbed down with antiseptic solutions in order to remove any harmful bacteria. Removal of normal flora and altered skin pH were also outcomes (Marbut & Loan, 1996).

Failing to keep patients clean or omitting a bath is not considered acceptable nursing care (Wolf, 1993). Perhaps this is why the nursery admission bath became so embedded in nursing practice. Admission baths were a mechanism whereby 'clean' babies entered a 'clean' environment. Some clinicians recommend that immersion bathing be withheld until the umbilical cord separates and if applicable, the circumcision is healed (Lund, Kuller, Lane, Lott, & Raines, 1999).

On December 8, 1971 the Food and Drug Administration of the United States of America issued a warning against the use of hexachloraphene as a soap solution for infants. As a result many institutions switched to other cleansing solutions (Najem, Riley, Ordway, & Yoshioka, 1975), including phisohex, Mennen baby soap, and savalon (Martin, Streng, & Miller, 1983). Since 1974 the American Academy of Pediatrics has recommended not bathing newborns to reduce the potential for heat loss, and prevent absorption of toxic agents through the skin. Similar guidelines were published in Sweden and Great Britain (Emmerson & Jenner, 1978: Lagercrantz and Nyström, 1978). Martin and colleagues (1983) report that these recommendations were largely ignored in the United States.

Leboyer (1975) recommended bathing newborns to facilitate transition from uterine to extrauterine life. Others suggested that infants be bathed rather than washed for the following reasons; there was no reduction in skin flora if washed, heat loss was less, and babies cried less (Henningsson, Nyström, & Tunnell, 1981; Hylén, Karlsson, Svanberg, & Walder, 1983). In a study designed to assess the use of antibacterial solutions 150 infants were randomly assigned to one of five groups (Hnatko, 1977). Infants' skin was swabbed in three sites (groin, axilla, and umbilical cord area). Four groups of 25 received an initial bath using one of four antibacterial solutions, the fifth group (n = 50) had a bath in tap water with no soap. After the bath, a trend toward a reduction in skin colonization was demonstrated but there was no significant difference between groups. As no difference was found between antibacterial soap and water it was recommended that newborns be bathed in water alone. Studies of the efficacy of infant bathing in a mild pH neutral soap could not be found.

Physiological Changes at Birth

Temperature control in the newborn

Thermoregulation is controlled by the hypothalamus (Thomas, 1994). Sensors located in critical areas in the body respond to both internal and external temperature changes and send signals to the hypothalamus which then processes the changes and sends regulatory messages in response (Darnall, 1987). In utero temperature fluctuations are minimal (Thomas, 1994). This changes at birth due to environmental factors. Heat loss to the environment occurs through conduction, convection, radiation, and evaporation. Alterations in thermal stability can result in altered acid-base balance, nutritional needs, and respiratory effort. While hypothermia is of primary concern, the effect of overheating newborns can result in heat stroke, hypernatraemia, and dehydration (Hicks, 1996). Karlsson and colleagues have evaluated methods of measuring temperature in neonates in order to understand the effect of heat flow (Karlsson, Hänel, & Nilsson, 1995; Karlsson, Hänel, Nilsson, & Olegård, 1995). Recommendations have been made to reduce the effect of heat loss following birth (Dahm & James, 1972) and include rapid drying and dressing at birth and swaddling skin to skin care contact with the mother (Karlsson, 1996). There is a significant morbidity world wide that is attributed to cold stress at birth (World Health Organization [WHO], 1993). Neonatal hypothermia has been associated with infection (Dagan & Gorodischer, 1984), delayed transition from fetal to newborn circulation (Stephenson, Du, & Oliver, 1970), and post delivery acidosis (Dragovich, et al., 1997). Neonatal hypothermia is of concern even in tropical climates (Iyengar & Bhakoo, 1991). Representatives of the WHO adopted a strategy of providing health care professionals with information to help reduce the incidence of hypothermia. Knowledge and practice of thermal control in infants in seven countries (i.e., Brazil, India, Indonesia, Kazakhstan, Mozambique, Nepal, and Zimbabwe) were documented and compared following a one day workshop. Many health care professionals were unaware of the dangers of inadequate heating in the birthing room and bathing infants immediately following birth. Following the workshop they made appropriate suggestions to change their own practice with apparent success. The long term effect of this workshop on change of practice was not evaluated (Dragovich, et al., 1997).

While infants are able to respond to quite small variations in ambient temperature, heat loss occurs quickly with larger decreases in temperature. The range of temperature that ensures thermal balance in infants is much narrower than in adults. The neutral thermal environment of a neonate is the environmental temperature range in which an infant maintains temperature with the least variation in thermogenic activity (Hicks, 1996). Infants achieve thermal balance in a warmer environment than do adults (Hey & Katz, 1970). At birth, the infant must adapt from a warm wet environment to a relatively dry cool one. Core fetal temperature is usually 0.5 °C higher than the maternal temperature. Dahm and James (1972) demonstrated that an infant who is wet can lose as much as 4.5 °C skin temperature in the first minute following birth with a slower core response over the next 30 minutes. A drop of 3 °C in skin temperature is usual if the infant is not dried (Greer, 1988; Sinclair, 1992). Most of the heat loss in the first 30 minutes of life is due to evaporation and radiation (Darnall, 1987; Hamerlund et al., 1980; Lyon, Pikaar, Badger, McIntosh, 1997). Due to the large body surface area compared to the mass of the infant, less thermal insulating subcutaneous tissue, and greater permeability of the skin to water, heat loss is greater than in the adult (Darnall, 1987).

Use of radiant heaters and incubators (Miller & Oliver, 1966) and hats (Chaput de Saintonge, et al., 1979; Greer, 1988) have not prevented a temperature reduction in newborns although the heat loss is minimized. In many institutions the newborn infant is placed in the nursery under a radiant heater for observation and warmth following bathing (Anderson, Lane, & Chang, 1995).

Full-term infants are born with an ultradian rhythm of both heart rate (Ardura et al., 1997) and temperature (Thomas, 1991). The cycle is less than 24 hours in length and is not linked to a light-dark diurnal (Thomas, 1991). Ardura and colleagues (1997) demonstrated that the heart rate ultradian pattern was approximately 3 hours in length, but was not linked to feeding. The pattern disappears between the 2nd and 4th week of life. Unlike the adult, infant temperature, blood pressure, and heart rate are not coordinated (Thomas, 1994). Ardura and colleagues (1997) measured heart rate in term infants (n = 98) in a repeated measure design that included different ages.

Physiology of the newborn skin

Skin, the largest organ in the body, protects internal organs, controls temperature, provides a barrier against foreign substances, stores fat, excretes waste products such as salt and electrolytes, and senses pressure (Harpin & Rutter, 1983; Lund, Kuller, Lane, Lott, & Raines, 1999; Seeley, Stephens, & Tate, 1992). At birth the skin is covered with vernix caseosa, a white grease that protects the skin in utero from the amniotic fluid that surrounds the infant. Lanugo or soft fine body hair may also be present and is more likely to be found in abundance in preterm infants. The presence and quantity is used to assess gestational age. By 12 weeks gestation the epidermal and dermal layers are present. By the end of the second trimester the epidermis is keratinised, but the dermis is less than half of its full thickness (Birchall, 1996). Sweat glands are present in the skin but do not fully mature until 2 to 3 years of age. Hair follicles, capillaries, and nerve endings are fully formed by the end of the second trimester. It takes approximately 26 days for cells from the basal layer to migrate up to the stratum corneum which is constantly removed by clothing and washing (Marbut & Loan, 1996). The adaptation of the skin from the uterus where the skin has been surrounded by amniotic fluid to the predominately dry cooler extra uterine life takes about 14 days (Marbut & Loan, 1996). At birth the mean pH of skin is 6.34 which decreases to a mean of 4.95 in 4 days as the skin colonizes with normal flora (Lund, Kuller, Lane, Lott, & Raines, 1999; Marbut & Loan, 1996). The acidic mantle acts as a defence against harmful microorganisms.

Newborn skin is sensitive to the environment. At birth the skin is sterile or contaminated by vaginal flora, lacks a complete protective barrier, and is prone to flaking and urticaria. By two weeks of life the skin has keratinised sufficiently to resist absorption of substances such as drugs (Harpin & Rutter, 1983), hexachloraphene (Curley et al., 1971), chlorhexidene (Aggett, et al., 1981) and isopropyl alcohol (Shick & Milstein, 1981) except when excessive amounts are left on the skin for prolonged periods. Isopropyl alcohol used in excessive amounts for umbilical care was associated with an infant being admitted in a moribund state to hospital (Vivier, Lewander, Martin, & Linakis, 1994). Neonatal skin care in North America is the subject of a 58 site investigation, sponsored by the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) and the National Association of Neonatal Nurses (NANN), to identify scientifically based practice for routine cleaning, adhesive application and removal, treatment of open wounds and skin breakdown, and control of transepidermal water loss. The results are not yet published (Lund, Kuller, Lane, Lott, & Raines, 1999).

Physiology changes in the circulatory system

At birth the normal term newborn undergoes rapid circulatory changes. The first gasp of air allows the lungs to inflate and the pressure to the right side of the heart in the circulatory system is reduced. This change in pressure helps the ductus arteriosus and the foramen ovale to close. Permanent closure takes a few days so a murmur may be heard as blood escapes through both passages during this time (Clarke, 1990). The ductus closes functionally by 96 hours but the anatomic closure does not take place until later with development of endothelial and fibrous tissue (Sansoucie & Cavaliere, 1997). However, the pulmonary and systemic pressure relationships can be altered to resemble fetal physiology during periods of intensive crying (Anderson, 1989).

There is a significant change in the circulatory system at birth from a parallel system to a continuous system but these changes are transitional and permanent change occurs over time (Walther, Benders, & Leighton, 1993). Understanding transitional circulation has become particularly important in recent years because corrective heart surgery is often attempted in the first day or days of life and the circulatory system requires different management both during and after surgery (Clarke, 1990).

Leffler and associates (1978) described the stages as a) the utero phase, b) the immediate phase, c) the fast phase, and d) the final phase. The utero phase is the stage prior to the onset of regular air breathing and is characterised by a high pulmonary vascular resistance. The immediate phase starts with the first air breath and continues for several minutes. The effect is to decrease the pulmonary vascular resistance, inflate the lungs, and increase blood flow to lung tissue. The fast phase is characterized by a continuous gradual decline in the pulmonary vascular resistance to about 80 percent of the total decrease that will occur. This phase will last several hours and significant fluctuations in pulmonary blood flow can occur as the ratio between aortic and pulmonary artery pressure increases. This is the phase that is most relevant to this investigation as it represents the physiological status of most infants during their first bath. By about 24 hours of age, most infants will be in the final phase which continues until about 10 days of life. During this time the pressures gradually transform to mature pressure gradients (Clarke, 1990).

Summary of physiological changes

Physiological changes are rapid at birth and stabilize some time after birth. Circulatory changes are rapid for the first 24 hours and continue for up to 10 days. The circulatory changes can be reversed to a fetal state with prolonged crying. Skin is functional in the term infant, but adaptation to a dry cool environment and keratinization is a process that takes place over one week. Temperature adaptation has been of utmost clinical importance because rapid hypothermia can occur when newborns are not dried and warmed appropriately. Prevention of neonatal hypothermia is a primary task for health care workers. While the infant is experiencing significant physiological change, procedures that may further stress newborns should be kept to a minimum.

Physiological Measurement in the Newborn

Measurement of temperature and heart rate in the healthy newborn should be as non-invasive and quick as possible. Rectal and axillary temperatures are reliable but the infant can be exposed to cold air for up to 5 minutes while the temperature is measured (Haddock, Vincent, & Merrow, 1986). Infrared tympanic thermometers (ITT) may provide an alternative to the standard mercury or alcohol filled glass thermometers as the infant does not need to be unwrapped and a measurement can be obtained in a few seconds (Hicks, 1996). Use of the tympanic membrane as a site for temperature analysis has been postulated as an accurate assessment of core temperature as the blood supply is shared with the hypothalamus where thermoregulation takes place (Schuman, 1993). A core temperature estimation is useful in obtaining an accurate assessment of thermal stability (Muma, Treloar, Wurmlinger, Peterson, & Vitae, 1991). There have been studies conducted to evaluate the accuracy and reliability of ITT as an accurate assessment of core temperature in children. Findings have been equivocal (Childs, Harrison, & Hodkinson, 1999; Davis, 1993). Some report that ITT is not valid for assessing fever (Muma, Treloar, Wurmlinger, Peterson, & Vitae, 1991; Schuman, 1993). Infrared temperature probes were reported to be reliable in evaluating infant temperature (Mayfield, Nakamura, Bhatia, Rios, & Bell, 1984; Johnson, Bhatia, & Bell, 1991). The validity of one study (Johnson et al., 1991) was challenged because the sample size was small ($n = 7$) and the ITT was not used in an appropriate mode (Yetman, et al., 1993). A correlation (r = 0.84) was found between deep rectal temperature and aural temperature in 70 term infants (Mayfield, Nakamura, Bhatia, Rios, & Bell, 1984). However, concern was raised that excessive vernix in the ear canal may preclude an accurate assessment of core temperature, similarly ambient air temperature may affect ITT readings (Hicks, 1996). It has been reported that newborns ITT temperature varies widely if compared to axillary or rectal temperatures (Yetman et al., 1993). Researchers concluded that infrared thermometers are readily available so studies should be conducted to ensure the safety and interchangeability of these instruments with axilla and rectal thermometers (Childs, Harrison, Hodkinson, 1999).

Mayfield, Nakamura, Bhatia, Rios, and Bell (1984) used a probe that touched the tympanic membrane. The technology has evolved so that the ITT shines on the tympanic membrane and the thermometers are easy to use. Bland and Altman (1986) recognized that correlation between tools that are measuring the same physiological parameter does not mean that they are equivalent. Two methods of measurement of the same physiological parameter may be correlated perfectly but indicate different values. The range of neutral thermal stability is small, and a measurement that consistently indicates hypothermia or hyperthermia may lead to treatment when none is required. A level of agreement can be defined using graphical and simple calculations; scatter plots and intraclass correlations. Both Yaron and associates (1995) and Childs and colleagues (1999) used the Bland Altman technique. The Bland Altman is described in Chapter Three.

Yetman and colleagues (1993) evaluated several different measuring devices in a study that controlled for calibration errors with a large sample size (n = 200). The authors concluded that as the health care professionals will use only one method of temperature monitoring in the term well newborn, the glass or mercury thermometer is the most reliable measuring tool. Taking rectal temperatures are associated with the potential for perforation of the bowel and therefore not recommended unless the axillary temperature is unobtainable due to hypothermia.

Loss of temperature is of particular concern to health care professionals working with sick and preterm infants. Several researchers have explored the most appropriate way to predict when core temperature is likely to drop. Decreased temperature is a source of stress for the infant (Bliss-Holtz, 1991; Cunningham, Deere, Elton, & McIntosh, 1992; Darnall, 1987; Hey & Katz, 1970; Lyon, Pikaar, Badger, & McIntosh, 1997). For continuous measures a probe attached on the skin located near or over the liver is a good non invasive indicator of central core temperature (Lyon et al., 1997). Peripheral temperature assessment, especially in term infants, can be accurately monitored with a probe attached to the sole of the foot (Karlsson, Hänel, Nilsson, & Olegård, 1995). For intermittent measurement and checking of continuous thermometer monitoring systems, core temperatures can be assessed by non invasive methods such as placing thermometers in the axilla and or infra red probes near the tympanic membrane (Lyon et al., 1997).

For temperature monitoring studies a variety of methods are recommended in order to check that temperature changes are consistent (Cunningham, Deere, Elton, & McIntosh, 1992). Axilla and aural temperatures individually have been shown to reflect core temperature accurately and have become standard practice when assessing older infants (Mayfield, Bhatia, Nakamura, Rios, & Bell, 1984; Mayfield, Nakamura, Bhatia, Rios, & Bell, 1984; Yetman et. al., 1993). If an infant is exposed for up to 5 minutes for a rectal temperature assessment, the infant may experience unnecessary cooling. The use of infrared tympanic thermometers requires further evaluation (Hoffman, Boyd, Briere, Loos, & Norton, 1999), because there is little data available to assess the reliability of ITT in infants during the first 24 hours of life.

Term Bathing Techniques

Temperature changes associated with bathing new babies have been evaluated (Crystle, Kegel, France, Brady, & Olds, 1980; Nelson, Enkin, Saigal, Bennett, Milner, & Sackett, 1980; Oliver & Oliver, 1978; Varda & Behnke, 2000). Leboyer (1975) advocated bathing immediately following birth. His practice has long been recognised as promoting a gentle birth experience for both mother and infant. The Leboyer method was shown to be safe and hypothermia (defined as temperature below 35° C) did not develop in infants even after prolonged emersion in water (Crystle, Kegel, France, Brady, & Olds, 1980; Nelson, Enkin, Saigal, Bennett, Milner, & Sackett, 1980; Oliver & Oliver, 1978). The water temperature was monitored and adjusted as natural cooling occurred. Air temperature was also monitored and adjusted and the birthing rooms were kept very warm during birth and while the infant was bathed.

Tub bathing was compared with sponge bathing at the mother's bedside between 3 to 4 hours after birth (Henningsson, Nyström, & Tunnell, 1981; Hylén, Karlsson, Svanberg, & Walder, 1983). Infants (n = 232, n = 618) who were sponge bathed had lower temperatures than those who were tub bathed. Infection rates were not significantly different between groups. The clinical impression was that infants in the sponge group screamed more although the frequency and duration of crying was not reported.

Twenty infants were bathed at the bedside in a study were axilla temperature was measured before and after a tub bath (Anderson, Lane, & Chang, 1995). The rationale for the study was to determine if infants could be bathed safely at the mother's bedside without becoming hypothermic. As well as minimal change in temperature the bath at the bedside was determined to be safe practice, and the bath time was an ideal time for teaching infant care (Anderson, Lane, & Chang, 1995). Raman and associates (1996) reported that daily bathing was not desirable due to loss of temperature in 9 out 35 infants term infants. The 9 infants required warming under a radiant heater. The authors do not specify if there were any long term effects associated with the hypothermic episode. The study was small without the normal controls one would expect in a controlled trial. In this study there was no control group, the sample was small, actual temperature changes were not reported, and the infants were left naked for unspecified times prior to the bath.

The author of a Canadian study (n = 100) concluded that there is no difference in temperature loss between infants who are bathed at one hour of age and those bathed at four hours of age. Infants' rectal temperatures were measured prior to the bath, and 1 and 2 hours following the bath (Penny-MacGillivray, 1996). The author theorized that the practice of bathing at one hour of age should continue so that birthing fluids are removed, thereby reducing the chance of transferring infectious organisms from the infant to health care professionals. The same conclusion was reached by investigators who report when infants (n = 40) were bathed at one hour of age compared to 40 infants who were bathed at 2 hours of age there was no difference in heat loss (Varda & Behnke, 2000). The range of temperature loss was 0.1 ° C and 1.1 ° C. Infant temperature was measured in the axilla prior to the bath, and at 10, 20, and 60 minutes after the bath. The drop in temperature was greatest at 10 minutes after the bath. In the recommendations the authors suggest thermal stability studies with infants at the bedside should be carried out as well as comparing different temperature measurement sites; they suggest axilla and rectal comparisons.

Rush (1986) investigated the association between bathing newborns and colonization rates of S. aureus in the newborn nursery. Infants were randomized to one of two equal groups. Ninety five infants were given an admission bath and a daily bath; 87 infants were sponge bathed as needed. All infants had one swab taken from the nose and one from the umbilicus on day 4. There was no difference between the two groups ($p = 0.69$) in S. aureus colonization. Infants who spent most of their time at the bedside had lower colonization rates. Also, infants born by caesarian section had higher colonization rates, perhaps because they spent more time in the nursery. No attempt was made to quantify the amount of S. aureus found on swabs. Infants in the study had average stays of 4.7 days. Today, infants across Canada are usually discharged home at 48 hours of age or earlier (Hanvey, Levitt, & Chance, 1996).

Newborn bathing has been recommended by the Centers of Disease Control in Atlanta (1988) because of the concern about transmitting viruses from infants to health care workers, in particular the HIV (human immunodeficiency virus) and Hepatitis B.

The assumption is that by bathing the virus load on the skin will be diminished or removed, however there are no reported studies to support the assumption at this time. All health care professionals are now offered vaccination against Hepatitis B if they work in high risk areas and maternal child is considered high risk because of the presence of blood on a daily basis (Health Canada, 1997). Women are now offered free HIV testing during pregnancy in most Canadian provinces. Pregnant women are strongly encouraged to take part in screening because of the availability of prophylaxis for the fetus (Connor, Sperling, Gelber, Kiselev, Scott, O'Sullivan, et al., 1994; Johnston, Haase, Armson, Lee, Manley, & Hazell, 1997). Data from the Montreal Hôpital Sainte-Justine have indicated the rate of transmission from mother to fetus was zero when the Pediatric AIDS Clinical Trial Protocol 076 study protocol was followed (Larke & Young, 1997). Evidence of transmission of the HIV from an infant to a health care professional could not be found in the literature. The number of infants infected by perinatal transmission up to June 1996 totalled 111 (Health Canada, 1997). No sero-conversions from splashes onto non-intact skin or into mucous membranes have been documented in Canada (Ricketts & Deschamps, 1992). Universal precautions, including wearing gloves while assisting with birth and for the first few hours following birth are recommended to protect caregivers from viral transmission (Health Canada, 1999a).

In Alberta, an anonymous unlinked prenatal HIV seroprevalence survey revealed a rate of 3.5 per 10,000, but the incidence in Edmonton was 6.0 per 10,000 (Larke & Young, 1997). The HIV notification will commence in 2000 at the federal level. The latest estimate of AIDS cases reported to Health Canada was 1.5 per 100,000 population in Alberta which is the same as the Canadian rate (Health Canada, 1999b). Numbers of AIDS/HIV infected women are increasing but are small compared to the number of women having babies. Screening is strongly encouraged and medication is available to reduce the risk of perinatal transmission. Newborn bathing studies have either been conducted to compare different types of bathing with thermal stability and/or with skin colonization.

Skin Colonization of Newborns

Newborns' body surface rapidly becomes colonized with microorganisms prevalent in their environment (Gooch & Britt, 1978). Colonization of skin is defined as the presence of normal flora which protects the skin and provides a barrier against potential pathogens by helping maintain the normal acid mantle. Skin infections occur when the balance between normal flora and pathogens is interrupted or when skin lesions occur (Tortora, Funke, & Case, 1992). Infants are born with immature immune systems. As a result of previous catastrophic outbreaks of infection in nurseries, many health care professionals adopted a practice of bathing infants in antibacterial solutions. Washing infants in antibacterial solutions eradicated organisms such as staphylococci, but in the opinion of the authors, this may cause colonization with other organisms (gram negative bacteria and group B streptococci) which are potentially more harmful to the newborn (Speck, Driscoll, Polin, O'Neill, & Rosenkranz, 1977).

The three major pathogenic species of staphylococci are S. aureus, S. epidermidis, and S. saprophyticus. S. aureus is the only organism that is coagulase positive in that it elaborates the enzyme coagulase which activates prothrombin causing blood to clot. The other two are coagulase negative gram-positive cocci. S. epidermidis is coagulase negative and is part of normal skin flora. Staphylococci have been associated with neonatal infections (Elias-Jones, Gordon, & Whittaker, 1961; Gooch & Britt, 1978; Hyams, Counts, Monkus, Feldman, Kicklighter, & Gonzalez, 1975; Jellard, 1957; Najem, Riley, Ordway, & Yoshioka, 1975) and continue to cause concern in nurseries (Monti, Tonetto, Mostert, & Oggero, 1996; Hedin & Hambraeus, 1993; Johnson-Robbins, El-Mohandes, Simmens, & Keiser, 1996). Coagulase-negative staphylococci (CNS) are now the most common cause of nosocomial infection in Neonatal Intensive Care Units (NICU) with S. epidermidis accounting for 70-80 percent of all infections and are associated with arterial and venous catheters (Johnson-Robbins, El-Mohandes, Simmens, & Keiser, 1996). Johnson-Robbins and colleagues confirmed that the incidence of sepsis was not influenced by colonization patterns of organisms found on the skin or in the rectum of preterm infants.

Between 10 to 25 percent of women carry group B Streptococcus (GBS) vaginally and can transfer the organism to the skin of infants during birth (Burman et al., 1992). Mortality from early onset GBS infection remains a concern through the world (Embleton, Wariyar, & Hey, 1998). For this reason many health care practitioners administer antibiotics to women in labour who are known to carry GBS because of the risk of acquired infection during birth. The risk of transfer of group B streptococcus without spontaneous rupture of membranes, is negligible because most infections are caused by the infant swallowing or inhaling infected amniotic fluid (Katz, 1993). While 15 to 30 percent of all women are known to carry group B streptococcus only 1 - 3 percent of women are symptomatic. Infants without other risk factors, such as prematurity, have a 1 in 200 risk of developing infection if their mother is colonized with group B streptococcus (Boyer & Gottoff, 1988).

The incidence of group B streptococcus colonization varies between ethnic groups and geographic locations. The incidence in the world is between 15 and 35 percent (Katz, 1993) Group B streptococci infections are a significant cause of maternal and neonatal morbidity (Katz, 1993). The treatment of group B streptococcus positive women in labour is recommended if they are classified as high risk. Pregnant women are classified as high risk if they have preterm labour, prolonged labour of over 18 hours with a temperature during labour greater than 37.5° C, diabetes, or multiple gestation. Group B streptococcus can be treated in labour as the organism is sensitive to a wide range of penicillins, cephalosporins, and clindamycin (Katz, 1993). Therapeutic levels of Penicillins can be found in cord blood one hour after maternal infusion (Morales, Lim & Walsh, 1986). Early onset (i.e., under 24 hours of age) group B streptococcus infection can be minimised by treating positive women in labour (Boyer & Gottoff, 1988). In a previous study (n = 148) the incidence of participants whose mothers were group B streptococcus positive was 16.2% (Medves, 1996).

Skin colonization is a normal process. Normal skin flora reduces colonization by potential pathogens and maintains the delicate pH balance between organisms required for normal skin activity. The use of antibacterial solutions in newborn nurseries has declined because there is a lower incidence of skin infections and lack of evidence supporting the efficacy of bathing infants with antibacterial solutions (Lund, Kuller. Lane, Lott, & Raines, 1999). The effect of short maternity hospital stays on newborn skin colonization and the effect of other methods of cleansing such as mild soap or water alone have not been found in the literature.

Postpartum Teaching in Hospital

The format and appropriateness of structured post natal teaching in hospital is under review because of shortened maternity stays, the requests of birthing families to receive teaching that they deem important (Ament, 1990; Beger & Cook, 1998; Evans, Dick, Shields, Shook, & Smith, 1998), changes in medical care, and prenatal education (Martell & Mitchell, 1984). Kuhn's theory (1970) concerning shifting from a recognized paradigm or idea to a new one can be used to explain nursing reluctance to accept new roles. Role changes are particularly relevant to postpartum care.

Rubin (1961) postulated that women were not able to take in information in the early post partum period (Ament, 1990). The idea of 'taking in' and 'taking hold' was described by Reva Rubin (1961) but more recent evidence has not supported her hypothesis (Ament, 1990; Martell, 1995; Martell & Mitchell, 1984). Rubin (1961) described a restorative phase that follows the 'drugged sleep of labour and anaesthesia' (p.754) with a deep sleep that is difficult to interrupt. Following this sleep a postpartum woman awakes and has a period of taking in that can last two days where she sleeps, eats, and displays passive and dependent behaviour. The second phase 'taking-hold' began when the birth mother begins to assert her autonomy and exhibits a confidence that helps her to organize and assume control. Rubin's theory has formed the basis for many nursing texts in maternity care (Clausen, Flook, & Ford, 1977; Reeder, Mastroianni, &

Martin, 1983). Planned care revolved around doing for women and their babies. Careful assessment of the methods of data collection reveals that the concepts were developed from observation of 15 women of whom only 9 completed the study (Rubin, 1967) and it is unclear if the theory was ever tested (Ament, 1990). Although the concept may have influenced nursing practice, Rubin modified her concept to one of subjective maternal experience and she did not continue to use the phrases 'taking in' and 'taking hold' (1984). Rubin's work appealed to nurses as very humane. Her theory may continue to develop until a more humane and germane paradigm is postulated (Kuhn, 1970). The paradigm has shifted slowly from 'nurses doing for and making decisions about care for birthing women' to 'women demanding choice and individual care'. The goal of postnatal care has traditionally been to encourage women to rest in a bed while their infants are cared for by skilled health care workers in the nursery. The nurse decided when teaching would take place which was often in the nursery with group sessions such as the baby bath demonstration (Thomas, 1995).

Martell and Mitchell (1984) developed a questionnaire, the Martell Postpartum Questionnaire (MPQ), with the intent of testing Rubin's theory. The variables were taken from statements reported by Rubin (1961) in her original work for example "I cannot seem to get enough to eat" as a 'taking-in' item and "I am regaining control over my body" as an example of 'taking hold' (Martell, 1996). A a small random sample of 20 women were administered the questionnaire each morning of their stay in hospital to answer two questions; one, do women show 'taking-in' and 'taking-hold' behaviours and attitudes, and two, do these behaviours and attitudes change during the course of hospitalization? While there were some attitude and behaviour changes found in the early postpartum period they occurred earlier than described by Rubin. In particular the attitudes that were identified did not exhibit a strong 'taking-in' or 'taking-hold' dimension. Ament (1990) reported that the 'taking in' phase lasted less than 24 hours in a convenience sample of 50 women while the 'taking hold' concept was inadequately measured. Ament concluded that women are not able to 'take in' new information in the first 24 hours, so postnatal teaching should start after 24 hours. The 1984 MPQ reliability sub scales were reported as questionable by Martell (1996). Internal consistency ranged from alpha = 0.6 to 0.68 by Ament (1990) for 'taking in' and 0.3 to 0.53 for 'taking hold'. Martell (1996) repeated her earlier work with 95 women who had uncomplicated vaginal births using the modified MPQ-R . Low Cronbach's alphas for the sub-scales remained. Martell (1996) postulated that while 'taking in' and 'taking hold' were possible concepts for maternity nurses they were not for new mothers. A four-point Likert scale was developed to replace the dichotomous scale of the first survey. The sample was small (N = 34) and data were missing. She concluded that women exhibited both 'taking in' and 'taking hold' patterns of behaviour at each assessment time. Valid, reliable, and responsive measures of adaptation to the postpartum period require further development (Martell, 1996).

Childbirth care since 1961 has changed dramatically. Women usually have less sedation in labour. They do not rely on nurses to remind them about personal care such as bathing; they do not see themselves as having mood swings or being impatient, and they are not hungry (Martell, 1996). A more recent study supported Martell's findings and concluded that 'taking in' and 'taking hold' do not take place sequentially and that the actual phases are so short as to be of little practical significance (Evans, Dick, Shields, Shook, & Smith, 1998). One hundred and twenty women completed the Ament (1990) version of the Martell and Mitchell questionnaire during the first post partum day and the following two mornings. Women exhibited both 'taking-in' and 'taking-hold' on the birth evening. The results were correlated with a sleep assessment tool (Snyder-Halpern & Halpern, 1987). While sleep disturbance was high and sleep effectiveness was low, neither were predictors of 'taking-in' or 'taking-hold'. As a result, the researchers encourage nurses to commence postnatal teaching as soon as the birthing family is ready (Evans, Dick, Shields, Shook, & Smith, 1998).

There are many opportunities for women to receive childbirth education in the antenatal period. As well as participating in antenatal education, women are expected to be active in the care of their infants during their hospital stay. Mothers and infants are nursed together with the recognition that early maternal-infant contact is an important component of care (Martell & Mitchell, 1984). The authors conclude that postpartum women are not receiving adequate information because many nurses still endorse Rubin's theory. They further note that the feminist movement was instrumental in changing attitudes and behaviours of women long before 1984 (Martell & Mitchell, 1984).

Anderson (1989) described continuous rooming-in as a key to encouraging higher breast feeding rates, teaching mothers to respond to infant cues, and reducing health care costs. Rooming-in has been recognized as helpful in adaptation to motherhood for women following vaginal birth (Cottrell & Grubbs, 1994; Hanvey, Levitt, & Chance, 1996; Midmer & Clemmens, 1991; Weiss & Armstrong, 1991). It may be especially valuable for indigent primiparas (Norr, Roberts, & Freese, 1989) as they may have missed out on prenatal teaching and care and be more vulnerable to post partum problems due to lack of resources both human and monetary. Mothers reported that identifying signs and symptoms of illness in the infant was their most important concern in the first few days (Martell, Imle, Horowitz, & Wheeler, 1989). The impact of rooming-in on bonding or attachment has not been established (Brown & Hellings, 1988), but attachment is more difficult while the infant and mother are separated (Anderson, 1989). In Canada, maternity family centred hospitals have introduced LDRP's so that 'the infant is cared for primarily in the mother's room (Hanvey et. al., 1996, p.17). Only 65 percent of hospitals surveyed have policies that support rooming in from 19 to 24 hours per day (Hanvey, et al., 1996). Sixty nine percent of respondents replied that their facilities separated mothers and infants for some period so that infants could be monitored in a nursery for up to four hours. Hanvey and colleagues concluded that 'separation following healthy birth has potentially harmful effects and there are no data which demonstrate the benefit of such separation' (p. 20).

Time for comprehensive teaching of maternal-infant care is limited in short stay maternity units (Beger & Cook, 1998; Field & Renfrew, 1991). If nurses spent time with mothers, listened to questions, and did not take over care they were rated more highly by parents in interviews about satisfaction with care (Field, 1987). Beger and Cook (1998) found that information on feeding, cord care, illness, and elimination patterns were rated as important by more than sixty percent of participants. In a comparison survey conducted to review the similarities and differences between mothers and nurses perceptions of important factors in postnatal teaching, well baby care was rated as very important by 60 percent of mothers and nurses (Beger & Cook, 1998). Nurses and mothers were also asked to report the most effective teaching modality. Individual teaching was rated highest (75 percent of mothers and 82.9 percent of nurses). Handouts and books were very effective for one third of the participants, while videos and classes were very effective for less than one third of the study population, (i.e., by both mothers and nurses). Handing out information is not sufficient, nurses need to go over the important points in the booklets and provide contacts for parents in the community (Field & Renfrew, 1991). Individual teaching was the preferred modality in a previous study (Maloni, 1994). The cost overall to the health care system of individual teaching may be more beneficial in preventing readmission and reducing postnatal stay even though the time involved may be more expensive than group teaching, especially if the individual teaching practice is valued and effective (Beger & Cook, 1998).

Summary

Patient bathing is associated with good nursing practice. The newborn bath remains a time honoured nursing routine but the risks and benefits have not been established. The risks of bathing newborns include hypothermia and separation of the mother and her infant. The benefits of bathing appear to be aesthetic and to minimize a small risk that potential pathogens and skin organisms will be transmitted to other infants or staff. Bathing newborns provides an opportunity for contact between infant and bather which is rich in touch and interaction (Lund, Kuller, Lane, Lott, & Raines, 1999).

Bacterial colonization patterns have not been established for healthy newborns during the era of early discharge programmes. Potential pathogens and normal flora are usually identified because staphylococci is the most responsible organism for nosocomial infections in nurseries. Colonization patterns have been reported using only nominal data (present or absent). Mild soaps have replaced antibacterial soaps as cleansing agents for newborn baths. The efficacy of mild soap has not been evaluated in colonization studies. Mild soap and antibacterial soaps have been compared when evaluating colonization patterns. If there is no difference between soap and water and water alone on colonization levels, then the use of soap can be challenged. There may also be an argument for not bathing at all in the first few days. It may be that friction alone provides needed cleansing or that cleansing is unnecessary. This may mean that infants could be bathed at home with assistance from nurses working in early maternity discharge programmes.

Thermal stability in healthy newborns during bathing, specifically the first bath, has been evaluated using two temperature measures; one before and one after the bath. Almost all bathing studies have demonstrated that infants do lose heat while being bathed. The timing and extent of heat loss has not been reported. A comparison between bathing by a parent and bathing by a health care professional has not been reported in newborn thermal control studies. Newer faster techniques to measure temperature such as ITT (infrared tympanic thermometers) require further evaluation because ITT are readily available to parents from pharmacies and manufacturers are espousing the ease of use and reliability of ITT.

Parents have not been 'allowed' to perform the first bath of their infants in institutions. Health professionals bathe infants quickly as they have practised the technique and may bathe many infants during a single shift. In Canadian hospitals that do not have LDRP's, infants are bathed in nurseries within the first few hours of life. Family members may not be offered the opportunity to participate in the first bath.

New mothers are in hospital for less time than in earlier decades so early opportunities to gather information and support are reduced. The educational opportunity that is presented during the first bath is not utilized. Early discharge programmes may reduce opportunities for teaching so assisting the mother to bath her baby may be an important opportunity. A number of issues can be discussed at that time such as signs and symptoms of rashes, skin colour changes, diaper application, infant behaviour. normal newborn appearance, and mother infant interaction. Infrared tympanic thermometers are quick and easy to use.

The purpose of this investigation was to evaluate risks and benefits of the infant bath. Skin colonisation patterns were compared between infants bathed in water only or water and mild soap. Intermittent temperature changes were compared when the newborn was bathed either by the mother or the admission nursery staff. The validity of axilla temperatures has been established and the validity of infrared tympanic thermometers was compared in measuring the temperature of term infants at varying times throughout the bathing procedures. Skin colonization rates between infants bathed in either mild soap or plain water was compared.

CHAPTER THREE

Conceptual Framework

The conceptual framework that guided the study is perinatal comfort and well being (O'Brien, Evans, & Medves, 1999). Perinatal comfort and well being is a general developmental concept and is specific to birthing families. The perinatal period traditionally encompasses the immediate time before and after birth (Mayes' Midwifery, 1997; Oxford English Reference Dictionary, 1996). In the development of the concept of perinatal comfort and well being, the authors (O'Brien, Evans & Medves, 1999) have expanded the perinatal period to include the time of pregnancy planning, pregnancy, and lasts until 28 days following birth. This expansion is congruent with the time period of care provided by the two authors who are midwives (O'Brien and Medves) and is acknowledged by Evans as relevant in the development of a concept that seeks to guide practice with all women in the pregnancy, birthing, and post partum period. Comfort as a core concept for nursing has been investigated (Morse, 1983; Kolcaba & Kolcaba, 1991). Morse has mapped the concept from an historical view (McIlveen & Morse, 1995), the paradox of comfort (Morse, Bottorff, & Hutchinson, 1995), and from a phenomenological perspective (Morse, Bottorff, & Hutchinson, 1994). Kolcaba and colleagues pursued the analysis of the concept as distinguished from other key concepts in and for nursing.

Well-being is defined as a state where the individual is healthy, well and content (Oxford English Reference Dictionary, 1996). Well-being is a difficult concept to measure as the level to which an individual is healthy, well, and content is subjective. As well as subjective, societies also impose definitions of well-being which may be different from those providing health care. Women who are pregnant can be labelled 'at risk'. Research by Evans (1999) is directed at understanding the meaning of being labelled 'at risk' so we can comprehend the link between well-being and pregnancies which are complicated by conditions associated with risk to maternal and fetal health. Evans (1999) suggests that the implication of being at risk present real and potential threats to the well being of pregnant women and their families. The meanings that are attached to an 'at risk' pregnancy experience by women and health professionals can differ and result in divergent expectations and caring practices. She further contends that risk is a socially constructed discourse. Pregnancy is a natural physiological process that healthy women progress through as part of normal human development. Health care professionals are educated to recognize the abnormal in pregnancy, rather than to assume normality. Contentment comes with a recognition of satisfaction and acceptance of pregnancy, birth, and motherhood. The key components of perinatal, comfort, and well being, will continue to evolve through explication of the concept.

The goal of the research programme is to promote clinical practice that enhances perinatal comfort and well being (O'Brien, Evans and Medves, 1999). The interpretation and analysis of the concept is influenced by the perspectives of health care professionals. Subjectivity and primacy of women's experience as articulated in feminist critique are key to analysis of the concept while a variety of qualitative and quantitative research methods are used to test our assumptions about the concept (i.e., the randomized controlled trial). The perinatal period includes women and their families (as the women define them) during pre-conceptual planning, pregnancy, birth, and the first 28 days post partum. The fetus is viewed as an integral part of the women and not as a separate 'other' until birth. This view of mother and fetus as a single entity has recently been upheld in Canada through a Supreme Court Ruling (Dobson vs. Dobson, 1999).

In nursing it is traditionally accepted that comfort is a relief of discomfort (Morse, et al., 1995). Perinatal comfort is more than relief of discomfort and encompasses the strength of the women and her family; control over decision making; support by the community; and physiological, psychological, spiritual, and social comfort (O'Brien, Medves, & Evans, 1998).

Enhancing perinatal comfort underlies all research conducted by the researcher particularly promoting comfort in mothers and infants as they begin a new and connected but separate life together. With this is a belief that the mother-infant dyad should not be separated for the convenience of providing care. With birth the one becomes two and interaction of the two needs to be supported by those who provide care. Birth for each new mother is an intensely personal and unique experience. Bathing a new infant is part of the experience for new parents. First time parents may require more help and guidance than experience parents, however the opportunities for teaching and assisting in infant care require reinforcing. Infant temperature assessments are important skills for new parents, as techniques for effective and safe bathing are enjoyable for both parents and infant and minimize cold stress for the infant. Time spent in hospital or home while being cared for and supported by nurses and midwives should be maximized so that all procedures are explained individually and care given on an 'as needed' basis. Women should not be expected to provide a blanket consent prior to birth that gives health care professionals the right to remove infants for procedures that have not been explained. Each new mother and infant deserve individual care and support that is appropriate for her situation, her wishes, those of her family and her community.

Purpose of Study

The purpose of the study was to investigate the risks and benefits of the newborn bath. In order to assess the risks and benefits of newborn bathing, the efficacy of aural thermometers as an accurate measuring tool for newborn temperature was evaluated so that research question one could be addressed.

Research Questions

The research questions for the study were:

1) Is there a difference in temperature change during bathing when infants were bathed by either parent as compared to when and an infant was bathed by a health care professional ?

2) Does the use of mild soap rather than water alone affect the process of skin colonization over the first 24 hours of life?

As a randomized clinical controlled trial was chosen to answer the research questions two null hypotheses were developed.

Null Hypotheses

1) There is no difference in temperature change between newborn infants bathed by their mother or father compared to newborn infants bathed by a health care professional.

2) There is no difference in skin colonization between newborn infants bathed in a mild pH neutral soap when compared to infants bathed in water alone.

Sample

The sample was recruited from infants born at the Royal Alexandra Hospital, Edmonton. Infants were randomized to intervention and control groups for each research question. Group 1 was bathed in water by one or other parent. Group 2 was bathed in a mild pH neutral soap and water by one or other parent. Group 3 was bathed in water by the postnatal nursery nurse. Group 4 was bathed in mild pH neutral soap and water by the postnatal nursery nurse. The aural and axilla temperatures were taken in each infant before and one hour after the bath.

Infants born vaginally after at least 37 completed weeks gestation, with apgar scores of at least 7 by 5 minutes of age, admitted to the normal newborn nursery, and with no obvious physical abnormality were eligible for inclusion. Infants with planned discharge before 24 hours of life who lived outside the city limits were excluded. Infants born to mothers who were known to be HIV positive were excluded because of institutional policies around isolation of mother and infant following birth.

Demographic data obtained from the mother's chart included time and date of birth, ethnicity of mother, maternal age, type of birth, if antibiotics were given in labour, gestational length, parity, gender and weight of infant.

Sample Size

A power analysis was carried out to determine the correct sample size for the study. Conventional criteria for Type 1 and Type 2 errors were accepted, i.e., Alpha was set at 0.05 and Beta at 0.2 in order to set power at 0.8. For skin colonization a medium effect size of two categories difference (no growth, scant, light, medium, and heavy) was accepted as the least difference to be relevant clinically, as a marker for potential relevance. Using the statistical package Pass 6.0 to determine sample size, 64 participants were required for each group. Seventy participants were randomised to each group to allow for attrition from each group. The total for the two groups was 140 participants.

A drop in temperature of 1 °C was assessed as a medium effect size. Again, with Alpha at 0.05 and Beta at 0.2, 64 participants were required to assess a difference between groups for each measurement over time. Repeated measure analysis of variance requires less participants (n=30 would have been sufficient). Therefore with the sample size established for the colonization study, the sample size was sufficient to detect clinically significant differences for the temperature study as well. There was also no reason to believe that microbial growth had any effect on infant temperature during the initial bath so all infants were enrolled in both studies and after establishing that there was no interaction effect, the data were analysed separately. A study reported in January

2000 determined the appropriate sample size for comparing temperature changes between infants in an initial bath study with two study groups was 40 in each group. The authors assumed a standard deviation of 0.5°F with alpha at 0.05 to detect a 0.3° F difference between groups with power of 0.8 (Varda & Behnke, 2000). Translating these measures into degrees Celsius the standard deviation would be very small (0.28 degrees C) and probably not clinically important.

Methods and Instruments

Protocol of study

An information sheet outlining the study was given to all prospective parents on admission to labour and delivery by nursing staff at the Royal Alexandra Hospital (RAH)(Appendix A). Following birth, qualifying and interested parents were visited by the investigator. If willing to participate, the mother or father of the infant was asked to sign a consent form and a copy, with the information sheet, was given to each participating family (Appendix B). Infants were randomized to one of four groups using a randomly assigned group list generated by the biostatistician of the Perinatal Research Centre, University of Alberta.

The families were admitted to the postnatal ward by the hospital nursing staff. A demographic sheet was completed for each family (Appendix C). Following admission, infants were assessed and the investigator obtained a sterile skin swab from Site 1 (the umbilicus) and Site 2 (the anterior fontanelle). A short video, made for the study, demonstrating infant bathing was offered to all parents to help reduce the variability in what is known or remembered about infant bathing. The video clearly demonstrated bathing. Questions pertaining to bathing were answered at this time. Infants bathed by the nursing staff were transferred to the newborn nursery. One or both parents were invited to the nursery to observe the bath. Room temperature was measured with an alcohol thermometer within five minutes of the start of the infant bath. Infant temperature was taken with a thermometer in the axilla for five minutes prior to the bath and at one hour after the bath which is standard practice at this institution. Aural temperature using an infrared tympanic membrane thermometer was taken prior to the bath, after undressing, thirty seconds after the infant was placed in the bath, on completion of drying and one hour after the bath was complete. The investigator was blind to the contents of the soap bottle until the solution was poured into the bath water. The solution was stored in individual disposable opaque containers so that the researcher, the nursing staff, or the family of the participant would be blind to group assignment until the bath had commenced. Soap bottles were stored in a refrigerator and mixed within a week of anticipated use to reduce the chance of contamination. A diary was kept to record comments from families, issues with the study protocol, unusual occurrences on the unit, and conversations with health care staff.

Bathing protocol

Infants in the nurse bathed group remained in the newborn nursery following admission for their initial bath. They were bathed as per hospital protocol. When the nurse had completed a thorough examination of the infant, administered vitamin K, and ascertained that the infant was warm enough by measuring axilla temperature with an electronic monitoring device she indicated that she was ready to start bathing. The researcher checked and recorded the infant temperature with both a mercury axilla thermometer and the aural probe (First Temp® Intelligence Medical Systems, Carlsbad, CA) (Appendix D). The ear chosen for each aural temperature was the same for each infant. Most infants had aural temperatures taken in the left ear. However, infants whose bather was left handed had aural temperatures in the right ear. This was because of ease in reaching the exposed ear when the infant was held in the bath. Theoretically, there should be no difference between temperatures taken in one ear as compared to the other ear. By using the same ear on each infant the chance of difference was minimized. The bath water temperature was 38° C at the start of the bath, the temperature was measured just prior to immersion of the infant into the bath. The air temperature was recorded with an alcohol thermometer. The nurse wrapped the infant in a towel with the hands close to the body, leaving a portion of towel free to dry the face and head. The nurse then washed the infant's face with bathing water. The researcher then tipped the contents of the opaque bottle allocated to that participant into the bath water and the nurse washed the infants' hair with the flat of her hand and combed out any blood products that remained caught in the hair.

The infant was then placed back in the crib while the face and hair was dried. The infant was unwrapped from the towel. The second aural temperature was taken. The nurse transferred the infant into the bathing bowl and continued to wash the baby. A stop watch was used to determine when the infant had been in the bath for 30 seconds and a third aural temperature was then obtained. The nurse continued to wash the infant until all birthing fluids had been removed.

The infant was removed from the water and dried with a towel and placed supine and naked under a warmer. The water temperature was measured prior to draining the bath water. A fourth aural temperature was obtained and the infant was left to rest. Once the nurse determined that the infant was ready to be transferred out of the nursery she dressed the infant and either she or the researcher took the infant to the mother. At one hour after completion of the bath, the axilla temperature and the fifth aural temperature were obtained and recorded.

The nurses who worked in the nursery were assigned for a week at a time from the postnatal unit and therefore bathing techniques differed between the nurses even though there was a prescribed method. Such differences developed over time, and many nurses had worked on the unit for a number of years. Some nurses put soap directly on the skin of the infant while the infant was still under the warmer and then transferred the infant to the water to rinse for as short as 10 seconds. All the nurses did agree to wash the face and head first for the study so that the second temperature could be taken at the appropriate time. When the nurses gave a baby bath demonstration to new parents' the bath was always as per nursery protocol. The video was developed using the nursery protocol.

Infants bathed by their parents were transferred to the bedside in their crib following admission checks carried out by nursery staff. The door to the room was closed to reduce the possibility of convection heat loss through drafts (Thomas, 1994). The infants were cuddled by one parent while the researcher filled the baby bath. The baby bath was a standard size baby bath, the water was filled so that the infant was covered by water upto the shoulders. As there are many different designs of post natal rooms at the

Royal Alexandra Hospital, the time taken to fill the bath and organise the room varied from 10 to 20 minutes. Once the video had been shown and questions answered, the bath water was checked and the first temperatures obtained both by axilla (mercury thermometer) and aural measures (First Temp®). The infant was bathed using the same protocol as was used for the infants in the nurses' group. The infant was then wrapped in a warm blanket, obtained from the warming cupboard on the unit, and given to the mother. At one hour after the bath the second axilla and aural temperatures was rechecked and recorded on the chart. Parents were encouraged to ask questions pertaining to bathing and infant care.

Microbiology protocol

The method for swabbing the skin for microscopy examination had been used in previously conducted clinical trials. The first involved venous and arterial catheters (Maki, Ringer, & Alvarado, 1991) and the second, a study of cleansing of umbilical cords (Medves & O'Brien, 1997). The swabs were placed in Stewart's transport medium and hand carried to the Clinical Microbiology Laboratory at the University of Alberta Hospital. The researcher inoculated an area of 2.5 cm in diameter at the edge of a blood agar plate using a rotary movement of the swab. The inoculated area was then streaked with a sterile spreader in one movement. The agar plates were incubated at 35°C for up to 48 hours and microbe growth assessed. All results were read by the same research microbiology technologist who was blind to group assignment (Appendix E). The investigator didnot have access to microbiology findings until the study was complete. The second set of swabs was taken one hour after the bath was completed and the third 24 hours following birth. For many participants the third swab was taken as the infant was being dressed to go home at approximately 24 hours following birth.

Infant bathing video

An infant bathing video, approximately 10 minutes in length, made specifically for the study, was used to demonstrate bathing a newborn. Four families were approached by the Perinatal Research Nurse and consent obtained. In the video, the researcher bathed three of the infants and described the procedure; a father bathed the fourth infant with assistance from the researcher. The bath was conducted as described in the protocol for the parents in the study. It was intended that the video would be watched by all participating families. This did not happen for a number of reasons. Only 8 families in the group bathed by the nurses watched the video, usually on the following day and prior to going home. Most families declined to watch because they had seen a video of infant bathing and were disappointed about being assigned to the control group. For those who were bathed by mothers, many reported that they would decline to be in the study if they had to watch a video on bathing. Anecdotal evidence suggests that prenatal classes offered in the city of Edmonton include a bathing video.

Equipment needed to show the video on the unit was frequently in use or broken. On two occasions the units were broken and not available for at least one week. Once the machine was missing for 10 days. The researcher made an effort each morning to ascertain where the machine was and to negotiate its use with others. These problems had not been anticipated because equipment was constantly available for a previous study.

Instruments

Colonization instruments were validated in a previous study. The technique of obtaining microbiology specimens, plating onto agar, and quantifying samples was well established prior to commencing the study (Medves & O'Brien, 1997). Dr. Robert Rennie acted as advisor in the event that the microbiology technologist had concerns with respect to organisms identified on plates.

Thermal stability instruments were borrowed or purchased for the study. All thermometers were calibrated to national standards. The aural thermometer was also re-calibrated weekly to support reliability of measurement. Axilla mercury thermometers were purchased for the study. The calibration of each thermometer was guaranteed by the manufacture, the medical technologist checked each thermometer prior to the study commencing and confirmed that the thermometers could be treated as reliable for the length of the study period. The hospital controlled room temperature between 25° C and 27°C . Alcohol thermometers were used to check water temperature prior to the bath. The temperature of the bath water was set at 38° C at the start of the study and measured at the end to note the change in bath water temperature. On average the bath water was 36° C by the end of the bath with a range of 1 to 3 degrees Celsius.

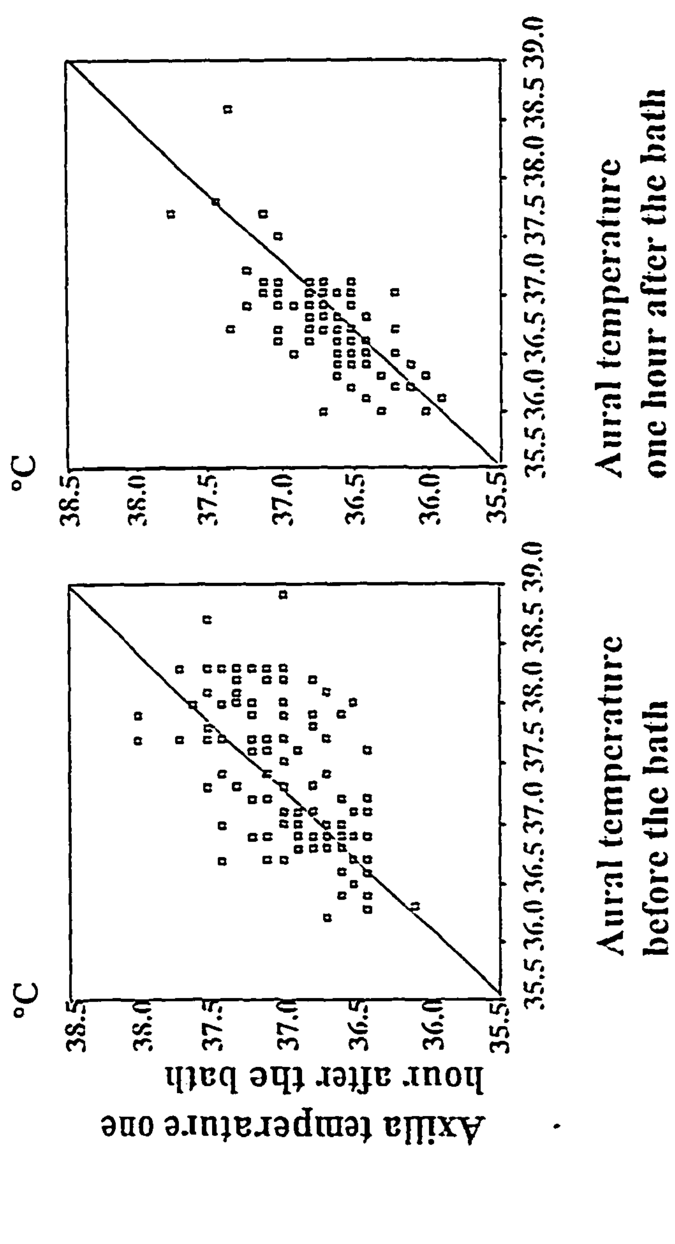
Two different temperatures were used to assess pre and post bath temperatures in study participants. The purpose was to evaluate the validity of the aural measures since these measures are quick and less invasive. The axilla temperature taken with a mercury thermometer is the standard of practice. Two statistical methods are used to evaluate instruments that measure the same physiological parameter with different measuring devices. These methods are described by the Bland and Altman (1986) and include a graphic assessment of data using scatter plots and the Intraclass correlation coefficient. While the two measures may be highly correlated, (i.e., both instruments are reliable) the measurements may not reflect true body temperature (i.e., one or both instruments may not be valid).

Intraclass correlation coefficient was chosen for a number of reasons. The technique of assessing the comparability of the same measure using different instruments is sometimes referred to as the Bland and Altman technique (Hoffman, Boyd, Briere, Loos, & Norton, 1999; Nield & Gocka, 1993). Bland and Altman described the statistical methods for assessing agreement between two methods of clinical measurement in a series of articles intended to educate physicians about the correct statistical methods for a number of clinical problems (1986). The authors described the necessity of having a technique to assess a new measurement by comparing it with an established measure in order to assess if the new measure can replace the old measure. Bland and Altman argue that as the two instruments are measuring the same parameter there is bound to be a high degree of correlation but that does not mean that the newer technique can automatically replace the older established technique. The Pearson product-moment correlation coefficient measures correlation rather than agreement. Two measures can be perfectly correlated if one consistently measures 1° higher. The relationship between the two would be linear and correlational rather than identical (Yaron, et al., 1995). Intraclass correlation coefficient corrects the correlation analysis by accounting for different group means, as well as assessing the regression slope and intercepts.

Bland and Altman (1986) outline a three step procedure for determining level of agreement. Step one is to plot the data and visually inspect the scatter of points. A diagonal line is drawn on the scatter plot to guide the eye in determining the degree to which the data cluster on, above or below the line. The next step is to calculate the correlation coefficient (r) between the two methods. As the authors point out r measures the strength of the relationship while the level of agreement is required. The mean of the paired data is plotted against the difference between the paired data points. This step is taken as the data are estimates of the true value and the mean is the best estimate available. If the all the measured data points were located on the line of equality i.e., at zero, then there would be a level of agreement between the two measures. The bias is calculated by the mean of the difference. The bias should be close to zero and can be tested with a t-test. If the test concludes that the bias is statistically close to zero then on average the two measurements are equal. The limits of the agreement are defined as the mean plus or minus two standard deviations. This is similar to calculating the 95 percent confidence interval except that the standard deviation is used and not the standard error. By plotting the data on the figures it is possible to visually gauge the difference between paired values. The level of agreement for temperature data in the study was tested prior to the bath and again one hour after the bath. The first opportunity was prior to the bath and the second opportunity was one hour after the bath. Figure 1 is a scatter plot which demonstrates the axilla versus the aural measures before the bath and a scatter plot that demonstrates axilla versus aural measures one hour after the bath. Visually there appears to be a higher degree of correlation between the temperatures obtained after the bath.

Figure 1: Scatter plot of axilla temperatures versus aural temperatures

before the bath and one hour after the bath



All measures should fall on a straight line but as can be seen in Figure 1 the data points are scattered. The Pearson product-moment correlation coefficient between the two measures was $r = 0.588$, $p < 0.01$, 2- tailed before the bath and $r = 0.739$, $p < 0.01$, 2-tailed after the bath. The next step was to plot the difference between the temperatures against the mean which helps to visualize the agreement of the measures. Each data point is the difference between the axilla temperature paired with the aural temperature on one axis plotted against the average of the axilla temperature and aural temperature. Figure 2 demonstrates the difference versus the average of the axilla and aural temperatures taken prior to the bath. Figure 3 demonstrates the difference versus the average of the axilla and aural temperatures taken one hour after the bath. By comparing the Figure 2 and Figure 3 it can be clearly seen that where the temperature was near 37 degrees there was a higher degree of agreement whereas as in Figure 2 the infants that were warmer had less agreement between axilla and aural temperature.

Figure 2: Scatter plot demonstrating the difference between temperatures

versus averages before the bath

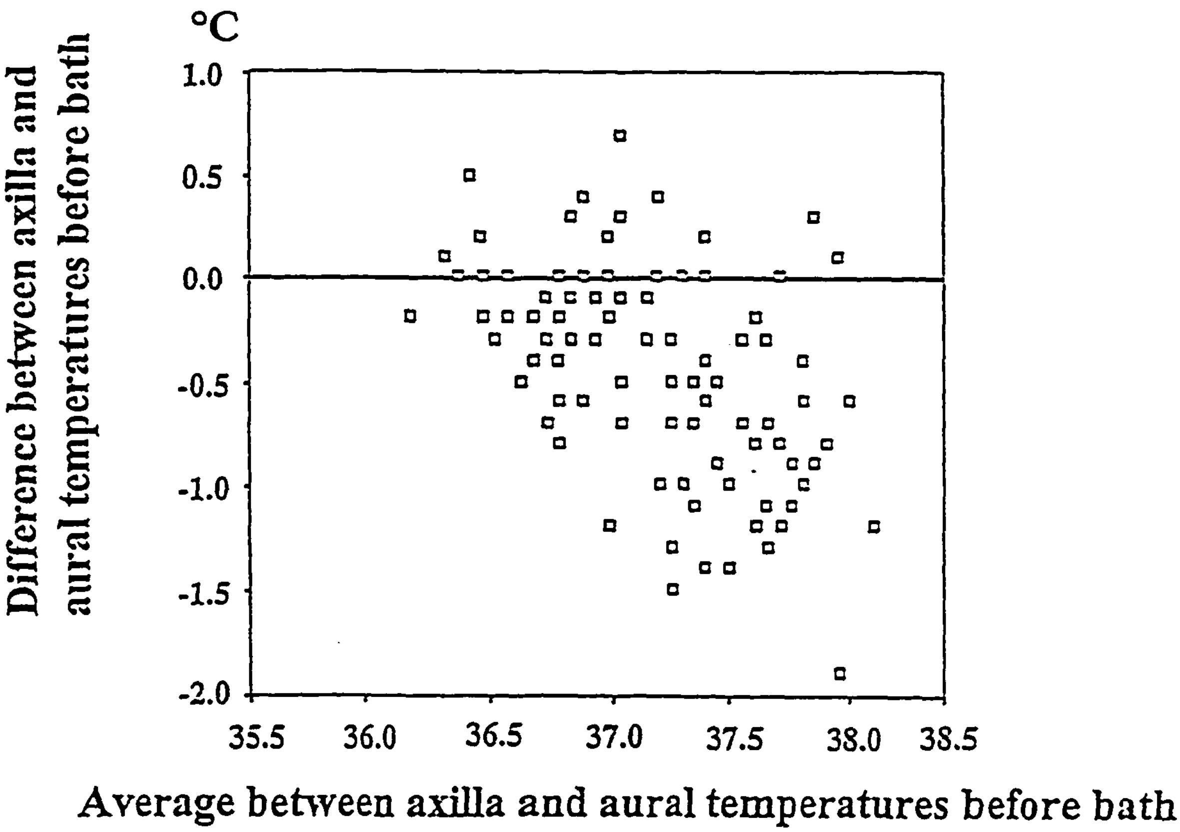
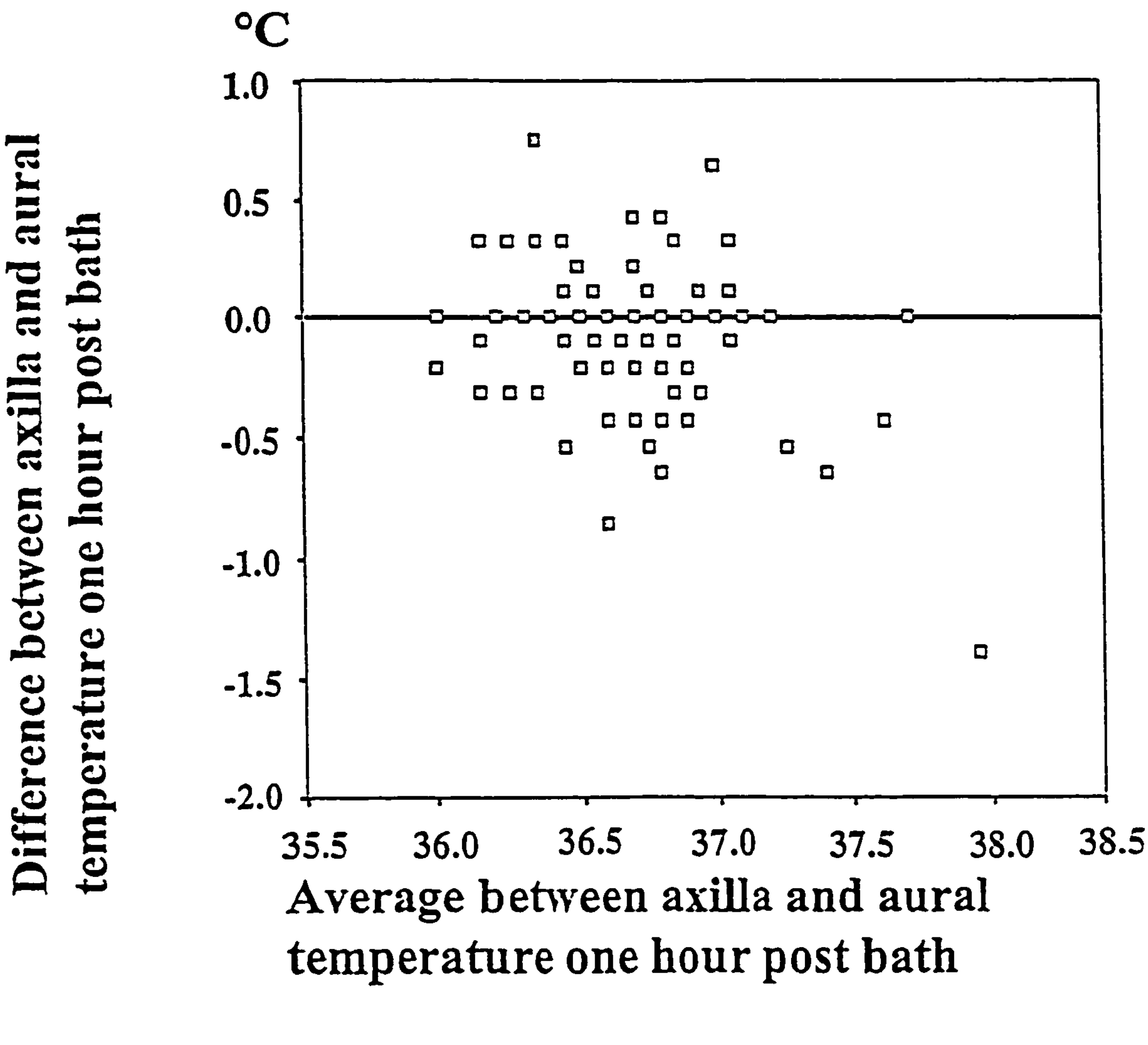


Figure 3: Scatter plot demonstrating the difference between temperatures versus averages of temperature one hour after the bath



The next step is to estimate the bias and the limit of agreement. The bias is estimated by the mean of the difference (Nield and Gocka, 1993). The data demonstrates that there is some agreement. The most useful assessment is the limits of agreement which describe how large the differences may be between the thermometers. The limit of agreement for the temperature taken prior to the bath is a mean difference of 0.43 degrees (SD 0.51) after the bath a mean difference of 0.07 (SD 0.26). The results of the limit of agreement are presented in Table 2.

Table 2: Bias estimate of temperatures taken prior to and one hour post bath

Paired data Difference between aural and axilla	Paired differences				t test degrees of freedom and significance
	mean difference	standard deviation	95% confidence interval		
			lower	upper	
aural axilla (pre bath)	0.43	0.51	0.33	0.52	8.866 df 110 $p < 0.001$
aural axilla (post bath)	0.07	0.26	0.02	0.12	2.941 df 110 $p = 0.004$

The thermometers may be more closely aligned one hour after the bath and less so before the bath because infants that were bathed by nurses had a mean aural temperature that was above 37.5 degrees C due to a period of warming under a radiant heater. The temperature of infants at the bedside was within normal limits but not as high as those placed under radiant heaters.

Another method of agreement assessment is the Intraclass correlation. Prior to the bath the intraclass correlation was 0.68 between the first aural and axilla measures and is not sufficient to describe the measures as interchangeable. One hour after the bath the intraclass correlation was 0.85 which is considered to indicate a degree of agreement between the two measures. The possible reasons for the discrepancy are provided in chapter five.

Ethical Considerations

Ethical approval was obtained through the Health Research Ethics Board, Panel B, (Appendix F); the joint committee of the University of Alberta Health Services Faculties, the Capital Health Authority, and the Caritas Health Group. Notice of Administrative approval was obtained from the Capital Health Authority (Appendix G). A letter of support was obtained from the Patient Care Manager at the Royal Alexandra Hospital (Appendix H). Permission was sought as soon as possible after birth due to logistics of post partum room allocation, to reduce the anxiety of nurses working in the nursery who wished to accommodate the study protocol, and the wishes of individual families.

CHAPTER FOUR

Analysis of Results

Data are reported in three sections. Groups were compared on important demographic variables to test that groups did not differ in the variables prior to the intervention. Data were checked for an interaction effect between the bather and the type of bathing solution. Since no interaction effect was found, the two research questions were analysed separately and group data was aggregated as necessary. To test Hypothesis One, data from Group One and Two, i.e., the parent bather group, was aggregated and data from Group Three and Four, i.e., the nurse bather group was aggregated. Similarly to test Hypothesis Two data from Group One and Three was treated as one group, i.e., bathed in water alone group, and Group Two and Four, i.e., bathed in soap and water group, were treated as the second group.

Data collected over time from the same participants is normally analysed with repeated measures analysis of variance (ANOVA) if a number of assumptions are true. Each measure must be independent of the previous measure (Sidani & Lynn, 1993). The time interval between data points should also be same, and there should be an equal number of observations or data points for each participant (Francis, Fletcher, Stewbing, Davidson, & Thompson, 1991). Continuous measures are most appropriate but ordinal data that can be treated as interval data can be analysed using ANOVA (Knapp, 1990). The data sets should have at least 5 categories for ANOVA to be carried out.

Á priori repeated measure of analysis of variance was assigned as the statistical measure to be used to test both Hypothesis One and Hypothesis Two. Hypothesis One was to be tested with repeated measures ANOVA for analysis of the temperature data as the measurements are on a continuous scale. The temperature data provided continuous data, but independence between measures cannot be assumed. Therefore, the data was checked using a multivariate analysis of variance approach to ensure that the conclusions were correct.

Data from the colonization study, Hypothesis Two was assigned to one of five ranked groups (i.e., no growth, scant, light, moderate, and heavy growth). As the categories are semi-quantitative and there are an adequate number of groups they were treated as interval data. However, microbiology samples did not produce data that was evenly distributed across ranked groups, the data was not normally distributed and there were frequent empty cells so data were analyzed using non parametric statistical analysis.

Demographic data

The demographic data sheet was developed to collect descriptive data (Appendix C). Antibiotic use in labour may have affected skin colonization so antibiotic use was treated as a covariate. At the study site it is usual for 40 to 50 percent of women to receive antibiotics in labour.

Temperature data

Temperature data was analysed using multivariate and repeated measures analysis of variance. Two axillary temperatures and five aural temperature measures were taken for each infant. Data were compared between groups (i.e., between type of bather).

Microbiology data

Microbiology data was analysed initially using analysis of variance for quantification of amount of bacterial growth and chi square analysis for presence or absence of bacterial organisms. Specimens were incubated in air, therefore no anerobes were identified. Organisms identified on blood agar plates included staphylococci, streptococci, mixed skin flora, diphtheroids, and coliforms. When there was no bacterial growth at 24 to 48 hours incubation, the plate was classified as no growth. Scant growth was less than ¼ of the area of the plate. Light growth was more than ¼ and less than ½ of the area of the plate. Moderate growth was more than ½ and less than ¾ of the plate. Heavy growth was more than ¾ of the plate covered with bacterial growth.

Study Period

Participants were recruited from 8 February 1999 to 9 June 1999. Recruitment was slower than anticipated because of a drop in birth rate at the study hospital, higher than anticipated Caesarian Section rate (April 1999 the rate was 27%), and lack of support from some staff members. Recruitment for the study was only possible when the investigator was in the hospital.

One hundred and forty infants were randomized to one of four groups. An assistant, who was not part of the research team, placed the group assignments in envelopes which were opened by a parent after the participant was enrolled in the study. The investigator was blind to bather until this time. A second assistant, who was not part of the research team, was responsible for filling the opaque plastic bottles with soap or water. Group assignment is presented in Table 3.

Table 3: Group assignment

Person giving bath	Bathed in Water	Bathed in Soap	Number of infants
Parent	32 (Group 1)	35 (Group 2)	67
Maternity Nurse	38 (Group 3)	35 (Group 4)	73
Number of Infants	70	70	140

An intent to treat approach was taken for analysis. One infant was incorrectly assigned to be bathed by a parent due to a randomization error and one infant was bathed by a father when assigned to the nursery group due to an emergency in the newborn nursery. One hundred and twenty-eight infants completed the colonization portion of the study and 111 infants completed the thermal stability portion. Data were analyzed only for those infants who had complete data sets. A decision was made not to replace missing data as there was sufficient complete sets of data to maintain power in the thermal stability study. Replacement of missing data can be misleading. A usual method of replacing missing data is to generate average or expected values. These values tend to be clustered around the mean and so there is a tendency for the missing data to influence the results by clustering around the mean, reducing the distance distribution of the standard deviation, and the effect of outliers to the overall model is reduced. A significant difference in results of a study can be masked because of a small standard deviation. In summary, the infants who were bathed by the wrong bather were left in the assigned group, those infants for whom there was incomplete data sets were excluded from the final analysis.

Missing Data

Three infants were excluded from the study prior to the first microbiology swab being obtained. One infant was excluded because the parents did not have sufficient English language skills. The other two infants were randomized to the study but the admitting nursery nurses inadvertently bathed the infants.

Two infants were admitted to NICU after enrolling in the study so data sets were incomplete. Three infants were admitted to the study by birth mothers so that the private adoptee mothers could participate in the first bath. All three infants were randomized to the group bathed by a parent but data are missing for one infant.

On several occasions the nursing staff discharged families home in under 24 hours due to overcrowding on the unit. Every effort was made to obtain the third swab from these infants on the following day but this was not accomplished in five cases. Microbiology swabs were mislaid on one occasion.

Instrumentation of the aural thermometer caused concern in that the thermometer periodically required de-magnetizing. So, the aural thermometer was de-magnetized frequently and occasionally a temperature was unobtainable as the magnet was only available in the nursery and not at the bedside. Nineteen infants had one or more aural temperature that were not taken and or recorded because it was overlooked or because of equipment problems.

Study Participants

All six swabs were taken from 128 (91.4%) infants. Table 4 outlines the number of samples obtained from the infants initial group.

Table 4: Infants who completed the Microbiology study

Infants randomized to bathing solution	1st specimen only	1st and 2nd specimen	1st, 2nd, and 3rd specimen	Total for analysis
Water (70)	68	66	63	63
Soap (70)	69	68	65	65
Total (140)	137	134	128	128

Temperature data was complete for 111 participants (82%). Analysis was completed for the 111 participants using analysis of variance. The number of infants who completed the study by group is illustrated in Table 5.

Table 5: Infants who completed the Temperature study

Bather / Temp	First Axilla Temp	Second Axilla Temp	First Aural Temp	Second Aural Temp	Third Aural Temp	Fourth Aural Temp	Fifth Aural Temp	Total for Study
Parent (67)	63	57	62	59	58	63	55	55
Nurse (73)	71	60	71	70	68	70	56	56
Total (140)	134	117	133	129	126	133	111	111

Demographic Data

Demographic data were collected in order to describe the sample of participants and to ensure that groups did not differ on important demographic and obstetrical characteristics. Demographic data is reported for those infants who completed the temperature study. Demographic data for the 140 infant sample is reported in Appendix I. Groups did not differ on gender, maternal ethnicity, gestational age, type of birth, and parity. Table 6 demonstrates the participant gender by group.

Table 6: Gender of Infant

Bather		Parent	Nurse
Gender of infant	Female	22	31
	Male	33	25

The sample was primarily Caucasian (70%), Asian (10%), First Nation (10%), and other ethnic groups (10%). Table 7 shows the numbers in each of the bather groups.

Table 7: Maternal Ethnicity

Bather	Parent	Nurse
Caucasian	40	47
Asian	9	3
First Nation	3	3
Other	3	3

All infants were born between 37 and 42 weeks completed gestation. The Royal Alexandra Hospital has a higher than expected induction rate due to serving as a tertiary care centre for high risk as well as low risk obstetrics. There was no difference between gestational age and bather groups ($\chi^2 = 2.324$, df = 5, p = 0.803) Table 8 shows the gestational age at birth by group.

Table 8: Gestational Age in Completed Weeks

Bather	Parent	Nurse
37 weeks	4	7
38 weeks	9	8
39 weeks	19	18
40 weeks	18	17
41 weeks	4	6
42 weeks	1	0

There were two breech presentations, the remaining were cephalic presentations. Swabs were taken from the anterior fontanelle although it would have been appropriate to swab the buttocks of the two infants in the breech group. One breech infant had six samples with no growth and the other breech infant had four samples with no growth and two with scant growth. The data by group and mode of birth is presented in Table 9.

Table 9: Type of Birth

Bather	Parent	Nurse
spontaneous	49	49
forceps	2	2
vacuum	2	5
breech	2	0

The distribution of parity by group is presented in Table 10.

Table 10: Parity with Birth

Group/Parity	Parent	Nurse
1st Child	24	20
2nd Child	20	20
3rd and more	11	16

Correlations between thermal stability and demographic data were not significant. Infant weight was normally distributed across groups and there was no difference between groups (F = 0.297, df 3, p = 0.827). There was no correlation between weight and axilla temperature change between groups (r = 0.052, p = 0.58). There was no correlation between hypothermia and bathers (i.e., temperature below 36.5 ° C) one hour after birth, (r = 0.057, p = 0.544). There was no correlation between weight and change in aural temperature between groups (r = 0.040, p = 0.649). There was no correlation between weight and temperature below 36°C at any time between groups (r = 0.042, p = 0.628).

Results of Question One - Thermal Stability Study

The hypothesis was that there was no temperature difference in infants bathed by a nurse when compared to infants bathed by a parent. There were no between group differences in infant temperature following birth ($F = 0.595$, $df = 1$, $p = 0.442$). The number of infants whose temperature was below 36° Celsius during bathing was not affected by who bathed the infant ($\chi^2 = 0.22$, $df = 1$, $p = 0.639$). The total number of infants with a temperature below 36°C was 38. Twenty infants were bathed by a parent and 18 were bathed by a nurses in the admission nursery. This was 34 percent of the total sample. The infants in the group bathed by mother had a lower temperature before the bath. This difference was statistically significant ($F = 14.439$, $df = 1$, $p < 0.001$). The range of infant aural temperatures is presented in Figure 4.

Axilla temperatures were taken on two occasions, before the bath and one hour after the bath. The mean difference of the drop in temperature from before the bath to after the bath was 0.36° C in the group bathed by parents and 0.19° C in the group bathed by nurses. The axilla temperature differences between bathers before the bath was not significant ($F = 0.112$, df 1, $p = 0.739$); there was a difference one hour after the bath ($F = 10.262$, df 1, $p = 0.002$) with those infants bathed by their parent having a lower axilla temperature. One hour after birth 25 infants (22%) had an axilla temperature below 36.5° which was not different between groups ($\chi^2 = 2.695$, df 1, $p = 0.101$). In Figure 5 a box plot of the axilla temperatures of the infants between bathers is presented

Figure 4: Box Plot - Range of aural temperature of infants between bathers

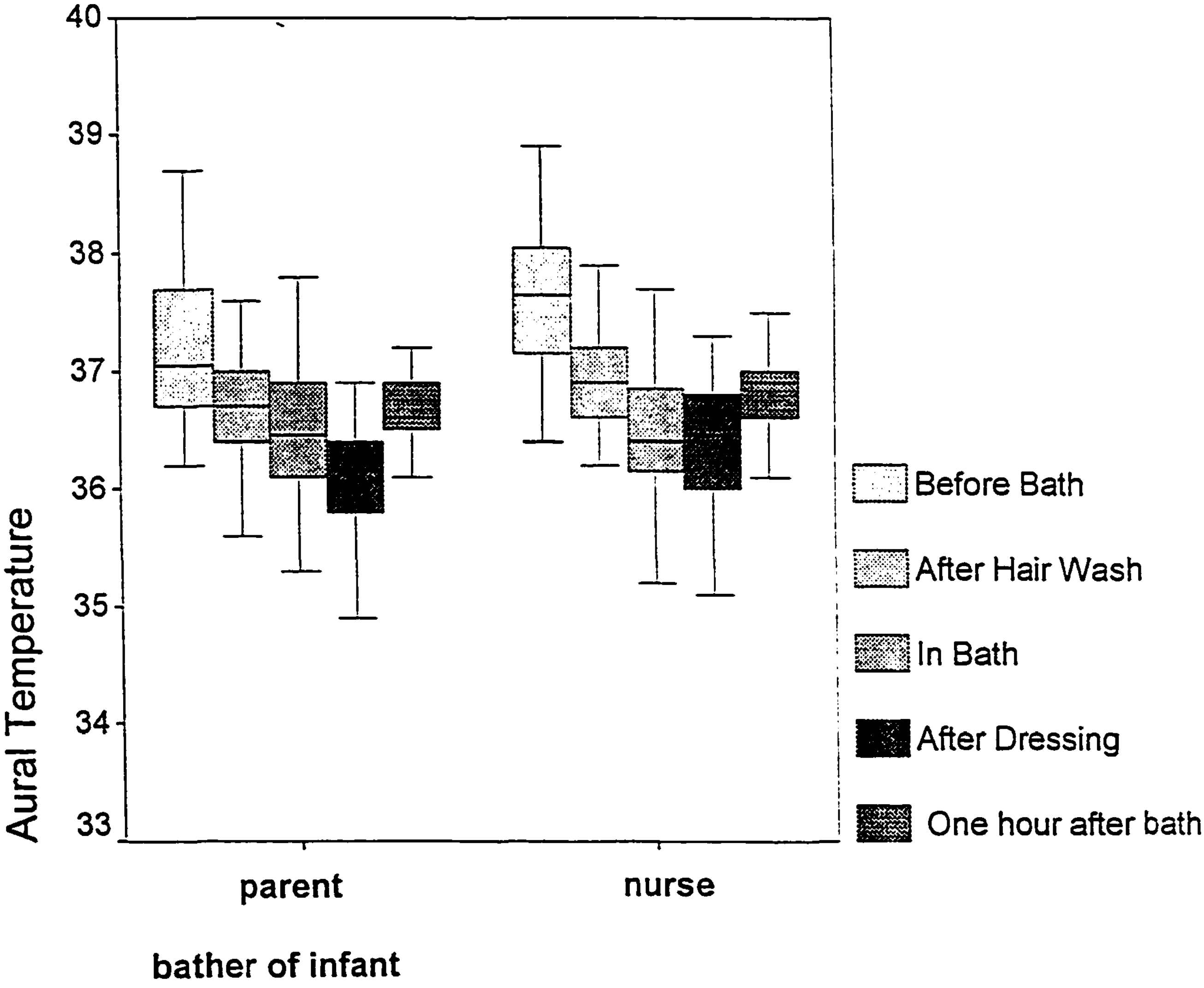
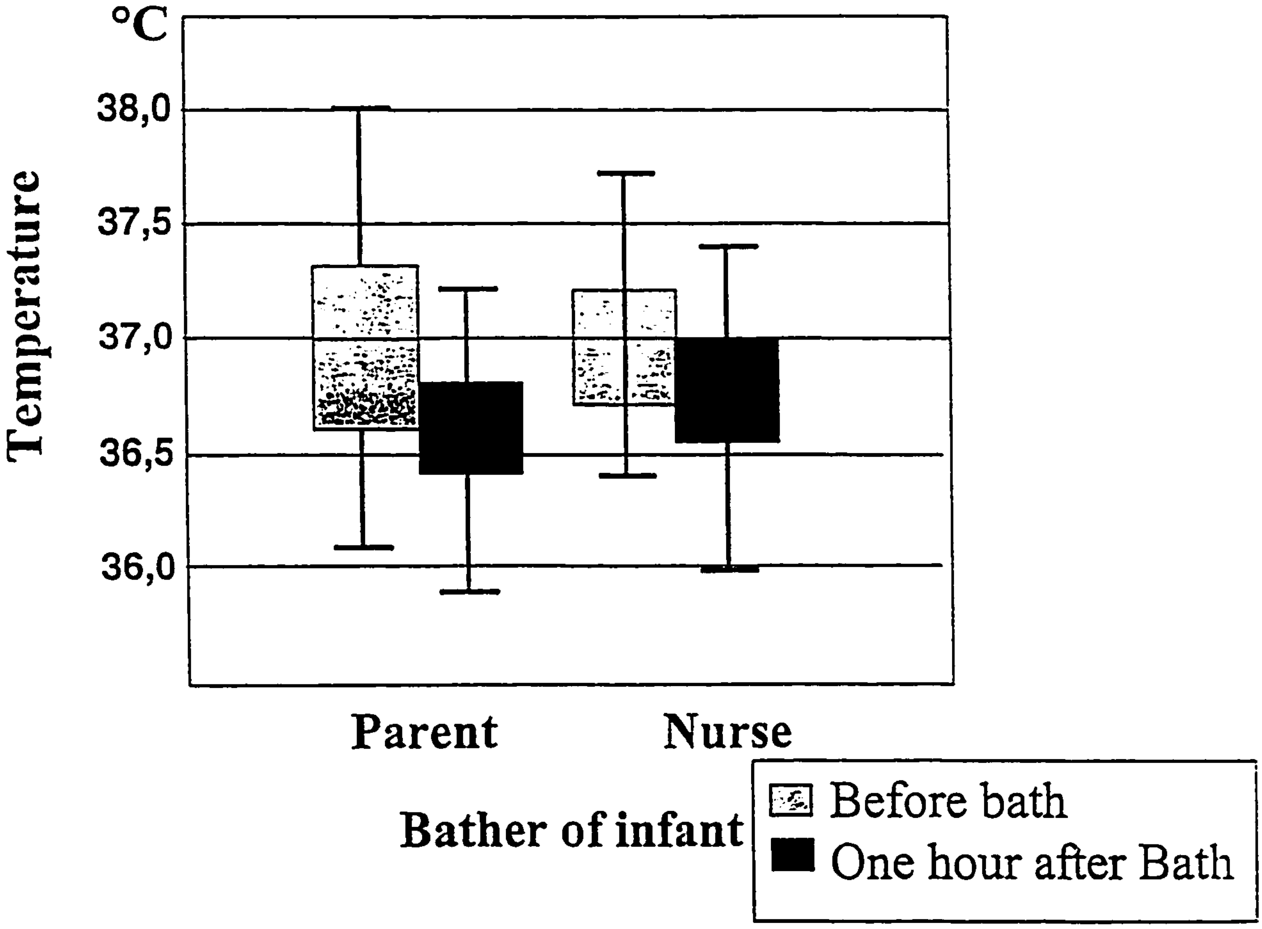
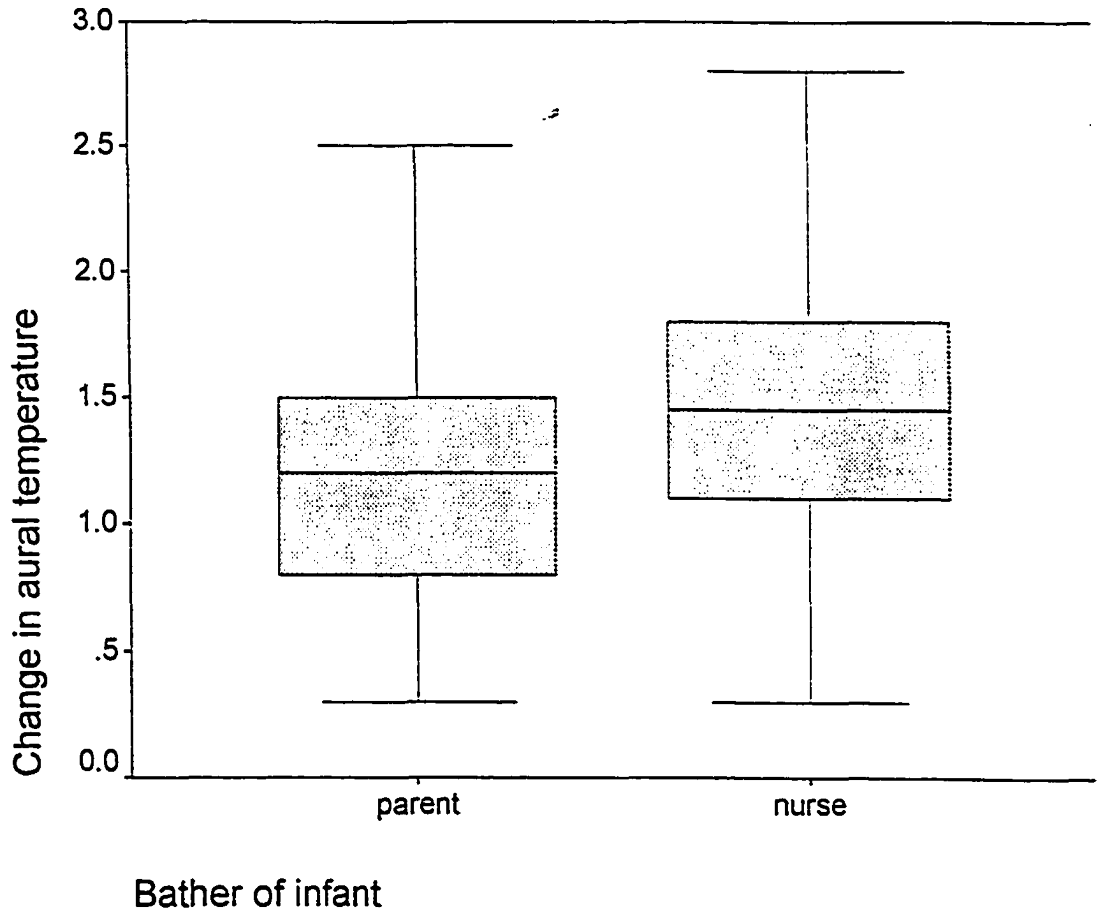


Figure 5: Box Plot - Axilla temperatures of infants between bathers



Aural temperatures were taken on five occasions, contemporaneously at Time 1 and Time 5 with the axilla temperatures. Correlations between the axilla and aural temperature measures were found before the bath ($r = 0.58$, $p < 0.01$, 2 -tailed) and one hour after the bath ($r = 0.75$, $p < 0.01$, 2 - tailed). The aural thermometer was set on the core setting. The different temperature testing methods demonstrate that axilla temperatures and aural temperatures can differ widely. One was a predictor of the other in only 34 percent of cases before the bath and 55 percent of cases 1 hour after the bath. The assessment of the different thermometers is reported separately. Initial examination of the aural temperature data revealed equality of variance across groups and time periods. There was a statistically significant difference between groups in temperature prior to the bath ($t = 3.8$, df 109, $p < 0.001$). The mean temperature in the infants bathed by a parent was 37.17 degrees C (SD 0.61). The mean temperature of infants bathed by nurses was 37.6 degrees C (SD 0.57). Multivariate analysis of variance with the temperature taken before the bath as a co-variate revealed no difference between the groups ($F = 0.595$, df 1, $p = 0.442$). Infant temperature decreased during bathing. There was a decrease in temperature in the group bathed by a parent with a mean change of 1.2 degrees C (SD 0.55) and in the group bathed by nurses a mean change of 1.5 degrees C (SD 0.59). The change in temperature between groups was different ($t = 2.515$, df = 109, $p = 0.013$). At the onset of the bath the infants bathed in the nursery had a mean temperature higher than the infants bathed by mothers. This difference may be accounted for as the babies were under a warmer in most cases until they were placed in the bath. The change in infant aural temperature is shown in Figure 6.

Figure 6: Box Plot - Change in aural temperature of infant by bather



Results of Question Two - Colonization Study

It was hypothesized that there was no difference in skin colonization between infants bathed in water alone and those bathed in soap and water. Microbial growth over time is presented in Table 11 and Table 12. At the umbilical site, 100 infants had no microbial growth before the bath, 116 had no growth one hour after the bath, and 46 infants had no growth at 24 hours of age. Microbial growth at the umbilicus is presented in Table 11 and at the anterior fontanelle in Table 12.

Table 11: Microbial growth over time - Umbilical site

Umbilical site by time		Solution for bathing		Total
		Water	Soap	
Before Bath	No growth	52	48	100
	Scant growth	11	20	31
	Light growth	5	1	6
	Moderate growth	0	0	0
	Heavy growth	0	0	0
One Hour after Bath	No growth	57	59	116
	Scant growth	7	7	14
	Light growth	2	0	2
	Moderate growth	0	1	1
	Heavy growth	0	1	1
24 Hours after Birth	No growth	25	21	46
	Scant growth	21	20	41
	Light growth	3	5	8
	Moderate growth	4	4	8
	Heavy growth	10	15	25

Note. Numbers represent number of infants in each category.

Similar findings occurred with anterior fontanelle swabs: 'no growth' from 98 infants prior to bathing, 108 'no growth' samples one hour after the bath, and 75 specimens had 'no growth' 24 hours following birth. Some infants had 'no growth' for one sample and microbial growth at other times. In all only 16 infants had six (i.e.. three umbilical and three anterior fontanelle samples) 'no growth' samples.

Table 12: Microbial growth over time - Anterior Fontanelle site

Anterior Fontanelle by Time		Solution for Bathing		Total
		Water	Soap	
Before Bath	No growth	48	50	98
	Scant growth	16	18	34
	Light growth	3	1	4
	Moderate growth	1	0	1
	Heavy growth	0	0	0
One hour after Bath	No growth	52	56	108
	Scant growth	13	12	25
	Light growth	1	0	1
	Moderate growth	0	0	0
	Heavy growth	0	0	0
24 Hours after Birth	No growth	41	34	75
	Scant growth	20	30	50
	Light growth	1	1	2
	Moderate growth	0	0	0
	Heavy growth	1	0	1

Note. Numbers represent number of infants in each category.

Independent samples t-tests (2 -tailed) were performed to compare groups at each time period and site. There was equality of variance in each time period and setting and there was no difference between groups; results varied from $t = 0.121$, $df = 125$, $p = 0.904$ to $t = 1.102$, $df = 125$, $p = 0.273$. While there was an increase in the rate of colonization over time, the rate of increase did not differ between groups. Data was checked with Quartile plots which showed the distribution was not normal.

Organisms were identified and reported. The organisms were coagulase negative staphylococci (CNS), viridans group streptococci (VGS), mixed skin flora (MSF), diphtheroids, coliforms, enterococcus, s. aureus, and group b hemolytic streptococci (GBS). One to three organisms were isolated on a single plate. A nominal count of each organism was completed and is reported in Tables 13 and Table 14.

Table 13 : Count of Organisms by Soap or Water Group over Time at the Umbilical Site

Microbe / Time	Before Bath		1 Hour after Bath		24 Hours after Birth	
Organism	Water	Soap	Water	Soap	Water	Soap
no organism	52	48	57	59	25	21
CNS	9	10	4	5	23	32
GBS	2	2	2	1	4	4
MSF	0	5	4	1	5	9
diphtheroids	4	4	0	0	1	0
enterococcus	2	0	2	1	5	6
VGS	1	1	0	0	1	1
S. aureus	0	0	0	0	4	2
coliforms	0	0	0	1	0	8
Proteus	0	0	0	0	0	1
Streptococcus sp.	0	0	0	0	1	0

Note. Numbers represent the counts of organisms not the number of infants as some infants had up to organisms isolated per plate.
CNS = coagulase negative staphylococci
VGS = viridans group streptococci
MSF = mixed skin flora
GBS = group b hemolytic streptococci

Table 14: Count of Organisms by Soap or Water Group over Time at the Anterior Fontanelle site

Microbe/ Time	Before Bath		1 Hour after Bath		24 Hours after Birth	
Organism	Water	Soap	Water	Soap	Water	Soap
no organism	48	50	52	56	41	34
CNS	7	9	5	5	9	15
GBS	1	0	1	0	1	0
MSF	7	5	4	3	8	13
diphtheroids	4	3	0	2	1	0
enterococcus	2	2	2	1	3	0
VGS	0	1	2	1	2	3
S.aureus	1	0	0	0	0	3
coliforms	1	0	0	0	0	0

Note. Numbers represent the counts of organisms not the number of infants as some infants had up to organisms isolated per plate.
CNS = coagulase negative staphylococci
VGS = viridans group streptococci
MSF = mixed skin flora
GBS = group b hemolytic streptococci

There are fewer than five events in many cells and therefore a chi-square analysis was not done. One assumption of using a chi square is that all categories have at least 5 events in each cell as chi square analysis determines the expected against the observed. The tables were collapsed to a 2 x 2 contingency table so that there was an adequate number of events in each cell. The results are presented in Table 15.

Table 15: Presence or absence of microorganisms over time

Solution/ microbial growth	Water		Soap	
	yes	no	yes	no
umbilicus before bath	13	49	21	44
	$\chi^2 = 2.081$, df = 1, p = 0.149			
anterior fontanelle before bath	16	46	19	46
	$\chi^2 = 0.186$, df = 1, p = 0.666			
umbilicus 1 hour after bath	10	52	8	57
	$\chi^2 = 0.381$, df = 1, p = 0.537			
anterior fontanelle 1 hour after bath	10	52	12	53
	$\chi^2 = 0.121$, df = 1, p = 0.728			
umbilicus 24 hours after birth	38	24	44	21
	$\chi^2 = 0.568$, df = 1, p = 0.451			
anterior fontanelle 24 hours after birth	22	40	31	34
	$\chi^2 = 1.945$, df = 1, p = 0.163			

The Friedman test is the non-parametric equivalent of the within subjects repeated measures analysis of variance. Skin colonization is a function of time. There was a difference found over time (Friedman $\chi^2 = 111.379$, df = 5, $p < 0.001$).

Nine infants had group B hemolytic streptococci (GBS) isolated on skin swabs. One infant had all six samples positive for GBS. All three umbilical swabs were positive for GBS from one infant, two infants had two umbilical swabs positive and five infants had one umbilical swab positive for GBS (all taken at 24 hours of age). Five infants were bathed in water and four were bathed in soap.

No difference in skin colonization either in microbes or quantity of microbes between infants bathed in soap and water and infants bathed in water alone.

Summary

No between group differences were found in amount or type of microbe found on infant skin following bathing in water alone or water and soap were found. Infant temperature decreases with bathing. This occurs regardless of who baths the infant, but the decrease was significantly less with parent bathers.

CHAPTER FIVE

Discussion

The purpose of the study was to assess risks and benefits of bathing newborns in the first few hours of life in hospitals. The assessment was multi-layered as the argument for bathing is based on nursing tradition and institutional protocols. There is world wide recognition that infants can become hypothermic quickly so there may be a presumption that only health care professionals can safely bath infants. The data from this study support the hypothesis that parents can safely bathe their infants. This could be advantageous as nurses could reallocate time spent completing routine baths to providing individual support and instruction to new parents.

Bathing in soap and water compared to bathing in water alone does not reduce the process of skin colonization nor does it reduce the variety of organisms that are seen. The finding supports a policy of delaying bathing for at least six hours as suggested by the World Health Organization (1997). Thus no benefit was found by bathing infants with soap. Viral transmission was not assessed and therefore the policy of wearing gloves when handling newborn infants for the first few hours following birth cannot be addressed (Centers for Disease Control, 1988; Health Canada, 1999a). Explanation of the study findings, the limitations of the study, implications for clinical practice, and recommendations for future studies will be discussed next.

The Efficacy of Aural Thermometers in the First Six Hours of Life

The aural thermometer was quick and simple to use for the study. The level of agreement between axilla measurement with a mercury thermometer and an aural measurement with ITT one hour after the bath was closer than prior to the bath. The difference can be explained partly by external heating of the infants under the radiant heater. Infant thermal response to environmental changes is well documented (Birchall, 1996). Infants lose heat through radiation, convection, conduction, and evaporation. While under a radiant heater the infant is receiving external heat. If the infant becomes over heated then the infant will use energy to loose heat. A cold infant will have a lower temperature in the extremities compared to the core as the infant attempts to preserve heat for internal organs first (Lyon, Pikaar, Badger, & McIntosh, 1996).

If the infant is experiencing a change in temperature either by external heating (i.e., radiant heater) or is using energy to produce heat then it is to be expected that there will be a difference between body temperature when measured at different sites. Tympanic temperature measurement is regarded as close to core temperature as the hypothalamus is close to the tympanic membrane. Axilla temperature is usually higher than skin temperature but lower than core temperature (Haddock, Merrow, & Swanson, 1996).

Researchers who evaluated the effect of the environment on the level of agreement between axilla and aural temperatures compared those under radiant heaters, in incubators, and in open cribs. The infants under radiant heaters were on servo control (i.e., a skin probe was attached to the skin and the heat adjusted from the radiant heater depending on skin temperature) (Hicks, 1996; Mayfield, Nakamura, Bhatia, Rios, & Bell, 1984). Studies were not found that compared aural temperatures to axilla temperatures during rapid heating using uncontrolled radiant heaters. Axilla temperature monitoring in the clinical setting is the standard in the study hospital for healthy newborns. The standard temperature measure was compared to the aural thermometers which are viewed with suspicion by some clinicians who believe that they are inaccurate. The decision was taken to use a mercury thermometer for a number of reasons. First, it was important to use a non electronic thermometer to reduce the risk of calibration error and mechanical failure (Yetman, Coody, West, Montgomery, & Brown, 1993). Second, the mercury thermometers have been used for many years and are considered accurate if used appropriately (Johnson, Bhatia, & Bell, 1991). That is, if the thermometer is given sufficient time to record the temperature and is held in the right position in the axilla of the infant. Mercury thermometers require at least three minutes correctly positioned to record an accurate assessment of temperature. The thermometer needs to be carefully placed with the bulb in the centre of the axilla, and the infant arm held against the chest and abdomen for the duration of the temperature assessment.

Aural thermometers are continuing to be evaluated because of concerns that the readings do not adequately record core temperature. The use of ITT (infrared tympanic thermometers) in infants has been evaluated but the comparability of ITT with conventional thermometers have most often been evaluated in adult studies (Erickson, & Meyer, 1994; Hoffman, Boyd, Briere, Loos, & Norton, 1999; Schmitz, Blair, Falk, & Levine, 1995; Terndrup & Rajk, 1992) and child studies (Chamberlain, Grandner, Rubinoff, Klein, Waisman, & Huey, 1991; Davis, 1993; Prazar, 1998; Robinson, Seal, Spady, & Joffres, 1998). Findings from studies in infants and newborns are equivocal. Johnson, Bhatia, and Bell (1991) recommend their use while Yetman, Coody, West, Montgomery, and Brown (1993) do not. Others recommend further evaluation (Prazar, 1998; Robinson, Seal, Spady, & Joffres, 1998). The reason for using tympanic temperatures for the bathing study is that it was considered the least invasive, fastest, and easiest (Hoffman, Boyd, Briere, Loos, & Norton, 1999).

The infants under the warmer whose aural temperature was 38 degrees or more tended to lie in a position that facilitated heat loss (i.e., legs extended and arms raised). Normally an infant will lie with arms bent at the elbows and legs flexed at the knees, especially if lying supine. Normal healthy term infants have been noted to stretch out only when attempting to lose heat (Thomas, 1994). In the post bath set of data, the two readings agree and therefore the thermometers can be used interchangeably. In reviewing previous studies concerning the use of ITT, the overriding assessment is that if the ITT is to become the standard, several readings rather than one should be taken (Hoffman, Boyd, Briere, Loos, & Norton, 1999; Prazar, 1998; Yetman, Coody, West, Montgomery, & Brown, 1993). One hour after the bath most infants were with their parents. Infants that were still in the nursery were usually dressed and wrapped in blankets. Only occasionally were the infants still under the radiant heater. The level of agreement was closer for aural and axilla measures. These findings can be explained as the infants were in a neutral thermal state. They were using minimum energy to maintain heat as they were dressed and wrapped appropriately so differences between core and axilla temperature should not be measurably different. The use of aural thermometers in the first day of life can safely be recommended as long as health care professionals recognize that thermal maintenance is unstable. Several aural measures are easier and quicker to obtain than several axilla measures. A number of environmental factors can have a profound effect on newborn infants. Infants undergoing warming through external means should have temperature assessment carried out from a number of sites including the axilla and ear canal (Johnson, Bhatia, and Bell, 1991).

Newborn Skin Colonization

A reason for infant bathing is that the infant is presumed to be potentially infectious until bathed. Potential pathogens viewed as harmful to health care professionals include HIV and Hepatitis B. To study the incidence of HIV on skin would be expensive, and there is no evidence that viral transmission can occur. Data is not available that supports the hypothesis that HIV can be acquired from the skin of infants (Health Canada, 1999a). However, because of the fear and lack of data-based recommendations of cleaning away blood and blood products have become standard practice. Blood and birthing fluid are tenacious and difficult to remove. A recent study reported that blood products could still be found on over half of infant stethoscopes following routine cleaning (Nick, 1999). Nick suggests that other surfaces may also have blood products that resist normal cleaning. While cross-contamination is theoretically possible there are no data to support this theory.

In the current study findings supported the hypothesis that bathing has minimal effect on skin colonization. The need for bathing can be challenged unless parents desire cleansing for cultural or aesthetic reasons. In a previous study the skin of infants born by Caesarian Section remained sterile for a longer period (Medves, 1996). Neutral pH soap and water did not differ from water alone in altering the normal acquisition of skin flora during the first 24 hours of life for infants in this study. Potential pathogens such as group B hemolytic streptococcus were not found on the skin of the small number of infants born to mothers who had received IV antibiotics in labour. This is encouraging for health care practitioners who are intending to reduce the incidence of infants who develop infections following maternal acquisition and transfer of potentially deadly microbes during labour and birth.

Nurses maintain that bathing after birth is partly to remove liquor and other birthing fluids because parents want the infants cleaned. Blood may dry on the head and leave the hair matted. A comb and soap help to remove the birthing fluids if the parents wish. The nurses commented that water alone made washing the hair particularly difficult. Nurses also commented that without soap they were unable to remove vernix caseosa, the protective barrier for the fetus. Vernix should not be scrubbed off as the underlying skin can be damaged (Liou & Janniger, 1997). Vernix provides an insulating layer to the stratum corneum which, if removed, puts the infant at risk of skin infection (Kuller, 1984).

Some parents comment that the baby smells nice after a bath and the smell is often that of the soap that has been used. Parents are encouraged to use a mild soap and informed about potential harm of using heavy perfumed soap to bath their newborn. Nursery staff can encourage the use of mild pH neutral soap by using the soap themselves. These recommendations are not new. As there was no difference between the two groups, parents should be encouraged not to scrub skin and to use a minimal quantity of soap. The purpose of this study was to investigate if there was a difference in colonization between infants bathed in soap and those bathed in water alone. If there is no difference then the necessity of the bath during hospitalization can be challenged, particularly those born into water and those born by Caesarian Section. The study findings support the hypothesis that skin will colonize over time with normal skin flora. Fecal organisms will be found especially in the diaper area. The incidence of potential pathogens colonizing the skin during the first day of life is low and not likely to pose a risk to healthy newborns.

The technique used to collect samples has been used before in central venous and arterial catheters associated infections (Maki, Ringer, & Alvarado, 1991). Reports of the use of the technique in skin colonization studies were not found. The design of the template was the same for each infant. A sample was obtained in the same manner by rolling the swab tip in a prescribed manner (Medves, 1996). The advantage of the technique was that it was easy to learn and provided an equal chance of obtaining positive samples for each infant. In studies where skin colonization has been reported semi quantification has not been reported. In this study semi quantification was utilized in order to determine if there was a significant increase in the potential to cause infection. Neither soap or water proved more effective in decreasing the amount of normal microbial flora or potential pathogens.

Thermal Stability of Newborn Infants

Bathing of infants does not need to be carried out in a place away from the mother's bedside. Infants lose heat during bathing, but the heat loss is not clinically or statistically different between those bathed by a nurse and those bathed by parents. Results from the study provide further evidence that temperature changes occur after birth in healthy newborns. The findings show that bathing causes infants to lose heat to the environment. Parents require help and guidance with their new family member and a role for nurses can be to approach teaching individually and provide the support that is required while the family are in hospital.

Bathing before six hours of life is not recommended by the World Health Organization because of temperature instability (1997). However, bathing in the first few hours of life is standard practice in many hospitals in North America due to institutional routines and concerns on the part of nurses and other institutional staff about acquired infection. A significant number of infants had a temperature decrease of at least one degree and in a number of infants the temperature decreased to below 36 degrees. Maintaining thermal stability, temperature within the range of 36.5° C and 37.2° C, will allow the infant to expend the least amount of calories (Bliss-Holtz, 1991). For a long time nurses have known the importance of keeping infants warm and bathing quickly and gently (Silver, 1905). Findings support the recommendations of the WHO that bathing should be quick, if at all, and in a warm room with minimal drafts. Water temperature should be monitored.

A temperature decrease was most marked in infants bathed by nurses in the admission nursery. These findings were not expected in that it had been assumed that infants who were bathed by 'experts' would lose less heat. Significant numbers of these infants were hyperthermic at the start of the research study, presumably because they were under the radiant heater. The researcher did not report the aural or axilla thermometer reading to the nurses but noted that infants bathed by the mother were often re-wrapped in the damp towel, that they had arrived in from the birthing room, rather than a dry clean towel, prior to returning to the bedside. Also the infants to be bathed in the nursery spent longer times under the radiant heater especially prior to the bath. If the infants are to be bathed in hospital there is no evidence that infants suffer more thermal instability when bathed by a parent. The most usual reason for parents enrolling their infants was so that they could bath their infant. Parents told the researcher that they enjoyed bathing their infant and fathers stated that they had gained confidence in handling their new child.

Cultural Practices around Infant Care

Maternal ethnicity data was collected to ascertain the extent to which cultural practices might affect infant bathing practices. Research findings are more easily transferable to clinical practice if participants are representative of the population. Cultural practices surrounding birth are important to families and must be understood by health professionals if culturally sensitive care is to be provided. Traditionally, well educated families whose mother tongue is English are more likely to take part in research and so special care was taken to encourage other cultural groups to participate. Of particular interest was the increased participation by Asian families. In an earlier study (Medves & O'Brien, 1997), Asian women were very reluctant to participate even when given information sheets and consent forms in their own languages. The Vietnamese and Chinese populations have been targeted for health care services in their own language, especially prenatal and parenting classes. All the Asian families who gave consent in this study described the classes enthusiastically and mentioned that culturally sensitive information is highly valued. One father from the Middle East told the researcher that infants are always bathed in salty solutions, without use of soap, for at least the first six months as it helps reduce body odour in later life. The researcher could find no reference to this practice in the literature. Another family, from Asia, reported that Canadians 'treat new babies like Kings'. He went on to explain that he was surprised by the care his wife received in the prenatal period and the compassion and care directed towards his child.

Cultural practices have to be considered by health care professionals when providing advice. Of the families that participated in the study, a number of parents were from different ethnic backgrounds. As a result, some of the questions asked by families were to confirm how bathing was done in Canada. One example was an Asian mother whose Portuguese husband wanted her to bind the umbilicus. The same family were undecided about feeding practices and required extensive guidance with advice from a number of the Cantonese speaking members of staff. Staff caring for this family and others have to consider not one but two cultural backgrounds when planning individualized care. The guidance provided by both Cantonese and other staff ensured the new family were educated and had the resources available if help was needed after discharge.

Education for Families in the First Day following Birth

Families enrolled in the study sought information during the study from the researcher. Time was spent with families answering simple and more complex questions. Typically education was provided following the bath until one hour after completion of the bath when the last temperature measurements and the second set of microbiology swabs were taken. Parents reported that the ward nurse had visited and performed tasks but did not stay to answer questions due to pressure on the unit to finish assigned tasks. Family members therefore sought information from the researcher. Information sought was typical of issues that could be discussed during infant bathing i.e., maintenance of temperature, skin care, diaper rashes, and infant cues.

There is little evidence to support the hypothesis that the mothers can not take in information during the first 24 hours following birth. Rubin's theory (1961) although questioned by more recent researchers (Ament, 1990; Martell, 1996; Martell & Mitchell, 1984) has persisted as a humane practice of encouraging rest and dependency in maternity care and will be hard to change unless an equally humane theory is developed. Martell (1996) asserts that research using qualitative methods are required to catch the subtleties and complex attitudes, experience and attitudes of postpartum women. Women's expectations of child birth, parental expectations of education within the health care system, a more mobile society, and socio-cultural changes that have resulted in many women working outside the home have influenced care provided to perinatal women. The responsibility of nurses as educators to prepare the new family has taken on greater importance. However, nurses need to be cognizant of their clients wishes and when parents request help with caring for their infant be willing to provide the care. Women who have experienced lengthy labours and births may view the assistance nurses can provide with gratitude and welcome the opportunity to rest and observe the nurses providing infant care.

Care is characterized by short postpartum stays, antenatal education, managed labour and birth, and comprehensive pain management. The changing role for women has encouraged independence and assertiveness (Martell, 1996). Women do not rely on nurses to bath them in the postpartum period (Martell & Mitchell, 1984). While Ament (1990) concluded that women do not 'take hold' in the first 24 hours, many women and infants in Canada are discharged home during this time and those responsible for teaching in the hospital need to provide information parents consider to be most relevant. Care and teaching are maximized if individualized to families. Bathing provides the ideal opportunity for teaching a number of infant care topics. As well as bathing, parents can be helped in diaper application, signs and symptoms of newborn rashes, skin care, holding techniques especially when the infant is wet and slippery. Discussion can be guided by parental concerns and safety issues including keeping the nursery warm and signs of wakefulness of their infants. If both parents and other family members are present during the discussion there is a greater opportunity for information to be 'taken in' and retained.

The experience of new fathers is studied more frequently today as there is a recognition that paternal adaptation is key to transition within the family (Henderson & Brouse, 1991). Fathers are actively encouraged to participate in infant care on the postnatal units in hospitals with the advent of family oriented care (Henderson, & Brouse, 1991; Waldenström, 1988). Greenberg and Morris described the bond as engrossment which is enhanced with the ability and desire to touch their newborn (1974). Bathing their new infant provides an opportunity to touch and can be used to encourage fathers to interact with their newborn. Each child is unique and the bond that is established between a father and a child is different and not dependent on birth order in a family (Ferketich & Mercer, 1995). Nurses should assess the involvement that the family thinks is appropriate and assist fathers to take part in bathing a first or subsequent child if they wish.

In this study there did not appear to be a difference in the fathers attitude toward infant bathing. While first time fathers expressed more hesitancy in bathing so fragile and tiny an individual, second time fathers appear to enjoy the experience and often thanked the researcher for the opportunity. Many of the fathers said that it was valuable to relearn as their other children now seemed big in comparison to the new infant. A more mobile society has lead to new parents being cut off from traditional support networks. Men may be expected to fulfill the role of family and neighbours as well as that of partner (Barclay & Lupton, 1999). The authors suggest that fathers are finding their roles difficult and would benefit from support from nurses and midwives. A role for nurses and midwives is to support the family in finding ways to care that will promote comfort in providing child care which is the underlying conceptual framework that directed this study.

By supporting and encouraging parents to participate fully in postnatal care, nurses are able to fulfill a number of roles. Firstly, an ideal opportunity for teaching is utilized when the birthing family is ready for new information or a refresher. Secondly, the nurse is able to provide true family oriented care that is individualized. The change in practice has implications for the staff on the postnatal unit. With individual care, staff have to be adaptable and prepared both educationally and philosophically to provide care on a busy unit. Individualized care is rated highly by new mothers (Beger & Cook, 1998). However, if staff who traditionally work in nurseries are able to move from room to room instead of having the infants come to them they will be able to help in the day to day running of the unit. The nursery workload varied in the study hospital. On many occasions the registered nurse was in the nursery with only one infant. This is not an efficient use of expert time. Also, because the nursery was available, routine bloodwork was performed in the nursery for the ease of phlebotomy staff. Parents were encouraged to drop their infants off and depart from the nursery. Again, as the infants were in the nursery, paediatricians were often able to quickly assess a number of infants in one place which meant that parents could not benefit from the teaching opportunities offered by the assessment. Postnatal staff can encourage other health professionals to perform routine tasks with the parents at the bedside and therefore give the parents opportunities to ask questions and be fully involved in providing consent for treatment and assessment. New parents will have increased confidence if they have been involved in all the care to their new infants and will have had opportunities to ask questions. This may reduce the anxiety that can occur when they are discharged home.

Development of Perinatal Comfort and Well Being

One goal of Perinatal Comfort and Wellbeing is to understand those actions that promote the concept. Promoting confidence in new families may be an outcome of Perinatal Comfort and Wellbeing and will require further exploration. By allowing family members to bathe the infants it is possible that we are able to promote confidence. Several parents, particularly fathers expressed an increase in confidence simply by bathing their infant. Bathing was perceived as a useful task that they could perform.

In this study quantitative data was collected in a systematic and prescribed manner, the nature of the data collection method allowed the researcher to observe in some detail the day to day practice of the maternity staff. While waiting for births the researcher was able to talk to and explain the study proposal to many health care professionals and new or expectant families. Data is required to guide the development of a tool to measure Perinatal Comfort and Wellbeing. Qualitative methods are required to gain an understanding of the issues that promote Perinatal Comfort because an understanding of the subjective experiences of families is more easily collected using qualitative methods. The researcher was able to ascertain that a number of areas require further exploration. In particular the discharge policy of new families after one post natal night, the effect of teaching during the recovery phase immediately following birth, and involving family members directly in care instead of nurses providing care in order to promote confidence in new families.

Perinatal care givers recognize the importance of basing care on cultural preferences for those from minority groups who may already feel vulnerable. An Asian father who felt his child was being 'treated like a King' demonstrated clearly that he thought the care was over and above what he expected. It would be easy to dismiss his comments and not explain why we appeared to be overly protective and watchful of his child. He needed to be reassured that the care his child was getting was 'normal' in Canada and he needed the nurses to recognize his confusion. He was from Vietnam and during his escape, capture and incarceration in a camp in the Philippines he had witnessed many deaths of infants and children, including close relatives. By talking about his experience he admitted that it bought back the horror he experienced and it also helped him accept the Canadian perspective of the 'preciousness of new life'.

Questions around cultural practices and history are important if we are to help families through pregnancy and birth.

Access to families to seek permission to participate was on occasion blocked by health care professionals. Sometimes families were not informed because staff assumed they were too tired. Promoting perinatal comfort involves supporting families as partners in care and as primary decision makers. Women did decline to participate due to fatigue; they were encouraged to made an informed choice. Over the course of the study period several women, who had declined to be in the study, approached the researcher to ask questions about bathing.

Women have stated that they value individual care (Beger & Cook, 1998) The researcher noted that information dissemination at the individual nurse and physician level is equally valuable and may be important if evidence based findings are to be implemented into practice.

Limitations of the Study

A few parameters were not measured as the importance was not recognized until data collection had started. The time spent under a radiant heater was not measured and would have been a useful parameter to compare between groups. While the researcher was masked to group assignment until after randomization it was impossible to remain masked to bather. The researcher never knew which solution group the infant was in until after the first swabs had been taken and the infant was being bathed. The nurses always commented when they did not have soap to wash the baby with and it was difficult to ignore the comments.

Clinical trials are expensive. By the very nature of a clinical trial, samples are larger so that between group difference can be detected. In order to obtain the largest number of participants in the study certain other parameters had to be abandoned. Studies that have large numbers of participants cause the data created by outliers to have less effect on the overall model.

Over the course of the study period labour and delivery staff as well as postnatal staff did not remember to page the researcher when an eligible participant was available. The unit is exceptionally busy with a number of trials in progress. As a result the participants were only enrolled in the study when the researcher was physically on the unit. Nurse led trials may not be valued by either administrative or nursing staff in the same way as physician led studies.

Qualitative as well as quantitative data would have increased the understanding of the experience of infant bathing. Much of the qualitative data collected are impressions and anecdotal evidence such as parents comments about bathing and infant behaviour when under the warmer. A qualitative approach should be included in future research. The extent to which the nurses reacted to bathing participants in the study and changed their normal practice was difficult to measure. The bias that was noted was that infants in the nursery study group tended to spend longer times under radiant heaters both before and after the bath.

Implications for Clinical Practice

Findings from this research study have implications for clinical practice. The mandatory bathing of newborns can safely be left for parents to do at a time that is convenient for them. Bathing with mild soap does not affect skin colonization which is a function of time. Clinical practice in a rapidly changing health care system can be difficult to evaluate, but these findings are consistent with encouraging family oriented individualized care at the bedside for the new family. Coupled with the expectations of society health care has to be delivered in a timely and cost effective way if funding is to be used widely to ensure healthy citizens in the future.

Many services were delivered in the home until after the second world war when health service delivery moved to institutions. Service delivery is returning to the community, in part due to the cost of acute care health delivery systems. An acute care system of health care became paramount with a model of fixing rather than preventing the problems. Maternity services became part of a medical model which included managing labour and treating each family as a potential problem. As a result women's wishes became devalued or were deemed secondary to the perceptions of safe practice. The control of pregnancy, birth and motherhood gradually changed from a primarily social to a medical domain (Oakley, 1984). Throughout the world women have challenged medical practices surrounding pregnancy. Midwives were highly criticized in the British review Changing Childbirth (1993) because they practiced midwifery in a medical model and adhered to managing labour, routine four hourly vaginal examinations, and continuous fetal monitoring. Consumer movements have led to informed choice so that women choose where they birth. Midwives are encouraged to give women choice, continuity of care and control over their decisions (Heptinstall, 1997). Much practice is excellent and should not be discarded simply because health care professionals have the technology that can give women choices (Heptinstall, 1997), however the practice requires evaluation. Heptinstall recognized that midwives are in danger of dismissing all technology without seeking the opinion and choice of women in their care, because they are encouraged to use non pharmacological methods of pain control for example. A birthing woman may request epidural anaesthesia and her wishes should be paramount. Findings from this study provided further evidence that some routine practices are unnecessary and may not meet individual requests and needs. Promoting the individualization of care is the most important component of any care plan.

It is in this milieu that midwives and nurses practicing in Canada support women in becoming active participants in their maternity care. While birthing at home is not supported as a choice for healthy women in some provinces in Canada, policies and procedures surrounding many practices in institutions are coming under review which may assist women in determining their active participation in care (Hanvey, Levitt, & Chance, 1996; Hanvey, Avard, Graham, Underwood, Campbell, & Kelly, 1994; Kaczorowski, Levitt, Hanvey, Avard, & Chance, 1998). Family centered care is a goal for maternity services in Canada and a key component is keeping mothers and infants together (Family-Centered Maternity of Newborn Care: National guidelines, 1987). Admitting newborns to the nursery for assessment and early care is a policy of many institutions. Part of the admission process involves a routine admission bath. In this research study, an attempt to further evaluate the necessity for bathing in the context of a changing health care system has been conducted. The risks and benefits of bathing required explication because of the changes in postnatal care. Coupled with shorter stays in hospital there has been a growing trend toward family oriented care with participation of the family. The data support the safety of parents bathing their infants while they are in hospital and utilization of time to individualize teaching based on the needs of a particular parent. New parents need as much help as they request and are able to absorb the information. Families are expected to manage at home 24 hours following birth with assistance from Public Health Nurses. So help and guidance provided by nurses should be supportive rather than process oriented.

The question of whether newborns should be bathed at all in the first 24 hours needs to be addressed. The World Health Organisation (1993) does not recommend bathing in the first few days of life. In North America the concerns of the Centers of Disease Control (1988) have an overriding influence on postnatal care because of concern over acquired infection. Perhaps this needs to be challenged and other strategies for protecting staff need to be considered. If an institution deems that bathing is necessary then the parents should be actively encouraged to bath their own newborn at the bedside. Caution should be taken to ensure that heat loss is minimized by ascertaining that rooms are warm and draft free, the bath is performed quickly, temperature assessment is timely, bath water is warm enough, and infants are dried and rewarmed thoroughly. Warming can take place by placing the infant in close proximity to the mother so that she can respond to infant cues for feeding and interaction (Ludington-Hoe, Hadeed & Anderson, 1991). Temperature assessment of newborns is likely best achieved with serial temperature measurements.

Future Research

Articulation of the concept of Perinatal Comfort and Well Being will underlie future research. During this project measures were taken from infants to investigate practice that could change practice for the nurses. If promotion of comfort in infants is to be investigated then other measures should be considered, for example infant crying, duration and intensity in the first day of life. Over the next five years studies will continue in order that the concept can be explained and a tool developed so that the concept can be measured for families which includes mothers, fathers and infants (O'Brien, Evans, and Medves, 1999). The continued use of admission nurseries is hard to justify but the move to couplet care or LDRP's has proved problematic for care providers. Workload measurement studies are needed to study the differences in practice and the acceptance of staff and families in providing care in more individual family centered modes. At the study hospital there is a need for nursery staff to care for those infants whose mothers are unwell and where families are not able to provide infant care. During the study period there were a number of occasions when the nursery was empty or had only one infant in the room. A study of nursery practice compared to couplet care that considers a variety of measures is required. Measures of continuity of care, satisfaction with care, cost benefit analysis of nursery delivery of care compared to couplet care, long time health benefits such as breast feeding, response to infant cues, and adaptation to parent hood, could be conducted in a comprehensive review of postnatal practices in institutions.

Further research is required to ascertain the level of agreement between different temperature measuring instruments. It is important to understand thermal stability in newborn infants. As technology improves the possibility of temperature measurement with small remote controlled monitors becomes possible. A physiological measurement study of term infant parameters such as respiration, heart rate, temperature, and partial pressure of arterial oxygen over an extended period of time will help develop an understanding of those occurrences that induce instability in infant physiological measures.

Research to determine appropriate times and places for teaching is needed. As many families are discharged home following short post natal stays it is imperative to understand when, how, and what new families require in terms of information. Qualitative data methods that seek to explore the experience of women in the first day postpartum with particular attention to teaching are needed. The experience of first time mothers may be different from those who have birthed before and therefore teaching needs may also differ. The opinion of women is needed in order to place teaching at the right time and in the right place. Innovative teaching methods that use community resources may be more appropriate.

The Skin Care Research Project in the United States will provide useful information of clinicians and give future direction for researchers. Cultural practices for skin care require exploration as the society of Canada expands to include new immigrants who have different ways of caring for the skin of their children.

Conclusion

No benefit was found from bathing newborns with mild soap in the first few hours of life and the risk of thermal instability was increased. As with other interventions the newborn bath, if not done in the presence of parents, can disrupt the development of the parent infant dyad. The new parents are not in a postion to observe and learn if separated from the infant. The effect of bathing has no effect on bacterial skin colonization. The only observed effect was to remove liquor and birthing fluids which are not harmful to the infant. If health care professionals feel vulnerable, then measures to prevent acquisition of potential viral pathogens can be taken such as wearing gloves and protective clothing when handling newborns. Promotion of individualized care for the birthing family can be encouraged. Parents are then able to choose to provide infant care or request either help or total care from nursing staff. With the option to choose the parents will then be in a position to request information about a number of topics pertaining to the care of mother and infant in the first few weeks of life.

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Appendix A: Information Sheet

1918 1998

FACULTY OF NURSING

University of Alberta
3rd Floor Clinical Sciences Building
Edmonton Alberta T6G 2G3
Canada

Celebrating 80 Years of Excellence

The Practice of Bathing Newborn Infants

Researcher
Jennifer Medves, RN, MN.
Doctoral candidate
1-403-492-0031

Supervisor
Beverley O'Brien, RN, DNSc
Associate Professor, Faculty of Nursing
University of Alberta
1-403-492-8232

Purpose: I am interested in the best time to bath your new baby. We have bathed new babies within the first few hours following birth to clean the skin of birthing fluids. I would like to know how low the bathing effects your baby's temperature. I would like to know if it makes a difference whether a nurse or the parents bath the baby. I will take skin swabs from the baby to see if it makes a difference to the normal skin bacteria if we use water only or a mild soap to bath your baby.

Background: I am asking all new parents whose baby's are born at the Royal Alexandra Hospital if they would like to be in this study.

Procedures: Everyone who is in the study will be put into one of four groups. You will not know which group you are in until after you decide to be in the study. We will not know either. You will have an equal chance of being in any of the four groups. This is called random assignment. In other words, this will be done in a fair way as in pulling numbers from a hat.

One group will be bathed in a mild baby soap solution and will be bathed by one of the nurses on the ward. One group will be bathed in a mild baby soap solution and will be bathed by the mother or father of the baby. One group will be bathed in water only and will be bathed by on of the nurses on the ward. One group will be bathed in water alone and will be bathed by the mother or father of the baby.

Fax: (403) 492-2551 http://www.ua-nursing.ualberta.ca

1918 1998

FACULTY OF NURSING

University of Alberta
3rd Floor Clinical Sciences Building
Edmonton Alberta T6G 2G3
Canada

Celebrating 80 Years of Excellence

The Practice of Bathing Newborn Infants

All the babies will have their temperature taken five times i.e., before undressing, when the baby is fully undressed, 30 seconds after the baby has been placed into the water, when the baby comes out of the bath, and 1 hour after the bath. All the babies will have a swab taken from the tummy button area and from the soft spot on top of the baby's head. We will take swabs again from the same places one hour after the bath. We will take the third set of swabs when the baby is 24 hours old. If you have already gone home we will come to your home to take the final swab at 24 hours following birth.

If you wish to take part in this study, please sign the consent form attached. If you have any questions about this study, please contact us at any time.

Benefits: You will see or participate in your baby's first bath. There will be no extra benefits to you letting your baby be involved in the study. Being in this study will not change the rest of the care given to you by the ward nurses. The information that we get from this study will help us decide the best way to care for new mothers and babies in the future.

Risks: There are no risks to taking part in this study.

Confidentiality: The results of the study will be kept in a locked cabinet. I will make sure that no-one can identify your baby's results from the any other baby's results. Your name or your baby's name will not be used in any article reporting the results. If I want to use the data from this study in another study in the future I will ask ethical approval in the same way as I have done for this study.

Freedom to withdraw: You may withdraw from the study at any time by telling myself or Dr. O'Brien. If you take part in the study it will not affect the care you receive while you are in hospital. Again, if you withdraw from the study your the rest of your care will not be affected.

If you have concerns about any aspect of this study, you may contact the Patient Concerns Office of the Capital Health Authority at 474-8892. This office has no affiliation with study investigators.

Fax: (403) 492-2551 http://www.ua-nursing.ualberta.ca

Appendix B: Consent Form

1918 1998

FACULTY OF NURSING

University of Alberta
3rd Floor Clinical Sciences Building
Edmonton Alberta T6G 2G3
Canada

Celebrating 80 Years of Excellence

Part 1 (to be completed by the Principal Investigator):
Title of Project: **The Practice of Bathing Newborn Infants**

Principal Investigator: **Jennifer Medves, RN, MN, PhD candidate.**

Co-Investigator: **Dr. B.O'Brien, RN, DNSc. Associate Professor, Faculty of Nursing, University of Alberta. Telephone: 492-8232**

Part 2 (to be completed by the research subject):

Do you understand that you have been asked to be in a research study?	Yes	No
Have you read and received a copy of the attached information sheet?	Yes	No
Do you understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that you are free to refuse to participate or withdraw from the study at any time? You do not have to give a reason and it will not affect your care.	Yes	No
Has the issue of confidentiality been explained to you? Do you understand who will have access to your records?	Yes	No

This study was explained to me by: ______________________

I agree to have my baby take part in this study

______________________ ______________ ______________________
Signature of parent of participant Date Witness

______________________ ______________________
Printed name Printed Name

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

______________________ ______________
Signature of investigator or Designee Date

THE INFORMATION SHEET MUST BE ATTACHED TO THIS CONSENT FROM AND A COPY GIVEN TO THE RESEARCH SUBJECT

Fax: (403) 492-2551 http://www.ua-nursing.ualberta.ca

Appendix C: Demographic Sheet

Data	Details	Code
I D Code		
Group		
Type of Birth		
Baby date and time of birth		
Watched video		
Maternal age		
Antibiotics in labour		
Maternal gravida and parity		
Gender of baby		
Weight of baby		
Gestational age of baby		
Ethnicity of mother		
Hospital chart number		
Swab 1 (before bath)		
Bath	Nurses	Parents
Swab 2 (1 hour post bath)		
Swab 3 (24 hours of age)		

Family name:
Address:

Telephone number:

Family Physician:
Telephone number:

Appendix D: Temperature Sheet

Infant Number	Time of Temperature	Temperature	Notes
Axilla temperature at start			
Axilla temperature 1 hour after bath			
Aural temperature at start			
Aural temperature at undressing			
Aural temperature 30 seconds into bath			
Aural temperature when bath finished			
Aural temperature 1 hour after bath			
Room temperature at start			
Bath water temperature at start			
Bath water temperature at finish			

Name of Temperature Recorder:

Appendix E: Microbiology Sheet

Case Number: ______________________ Date of Birth: ________________

	Laboratory analysis	Quantitative	Organisms isolated
Swab 1a (umbilicus) (Before Bath)			
Swab 1b (anterior fontanelle)			
Swab 2a (umbilicus) (1 hour after bath)			
Swab 2b (anterior fontanelle)			
Swab 3a (umbilicus) (24 hours after birth)			
Swab 3b (anterior fontanelle)			

Comments:

Appendix F: Ethics Certificate

Health Research Ethics Board

biomedical research
212.11 Walter Mackenzie Centre
University of Alberta, Edmonton, Alberta T6G 2R7
p.403.492.9724 f.403.492.7303
ethics@med.ualberta.ca

health research
3-48 Corbett Hall, University of Alberta
Edmonton, Alberta T6G 2G4
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ethics@rehab.ualberta.ca

UNIVERSITY OF ALBERTA HEALTH SCIENCES FACULTIES, CAPITAL HEALTH AUTHORITY, AND CARITAS HEALTH GROUP

HEALTH RESEARCH ETHICS APPROVAL

Date: January 1999

Name(s) of Principal Investigator(s): Ms. Jennifer Medves

Organization(s): University of Alberta

Department: Graduate Studies; Faculty of Nursing

Project Title: The Practice of Bathing Newborn Infants

The Health Research Ethics Board has reviewed the protocol for this project and found it to be acceptable within the limitations of human experimentation. The HREB has also reviewed and approved the patient information material and consent form.

The approval for the study as presented is valid for one year. It may be extended following completion of the yearly report form. Any proposed changes to the study must be submitted to the Health Research Ethics Board for approval.

Sharon Warren

Dr. Sharon Warren
Chair of the Health Research Ethics Board (B: Health Research)

File number: B-020199-NSG

University of Alberta   Capital Health   CARITAS HEALTH GROUP

Appendix G: Notice of Administrative Approval

Capital Health

Regional Research Administration Office
CSB 9-122, 492-1372

NOTICE OF ADMINISTRATIVE APPROVAL FOR PROPOSED RESEARCH

Site: RAH

Project Title:	The Practice of Bathing Newborn Infants		
Project Number:	M-169		
Investigator Name:	Medves, Jennifer		
Department:	Faculty of Nursing		
Division:			
Address:	506 Extension Centre		
Phone:	(780) 492-0031	Fax:	(780) 492-9954

Supporting Documents:

Ethics Appoval Date:	08-Jan-99	Ethics File #:	B-020199-NSG
Study Protocol	Received with Ethics Package		
Source of Funds:	Alberta Heritage Foundation for Medical Research		
Type of Funds:	Grant		
Overhead rate:	0		
Account Number:	U of A Account		
Contract Finalized Date:			
Revised:			

Project Approved:	04-Feb-99	Comment:	

THIS APPROVAL IS VALID FOR ONE YEAR

Valerie Elias, Manager
Regional research Administration

Copies to: Department Chair/Health Sciences Faculty
Vicky Afaan, Director, Accounting Services
Phil Heuchert, Manager Trust Research Accounts

Thursday, February 04, 1999

Appendix H: Letter of Support

Capital Health

REFERRAL HOSPITAL SYSTEM
Royal Alexandra Hospital Site

08 September, 1998

Jennifer Medves, RN, MN.
5308 Long Island Road
Manotick, Ontario
K4M 1E8

Dear Jenny:

RE: The Practice Of Bathing Well Newborns

I am delighted you wish to return to our facility to continue you research studies. I have spoken to Susan Chesney and she also supports your proposal. I note you wish to commence data collection in January 1999 and will continue for approximately three months. I understand you would like to recruit 140 infants for the initial study and 20 infants for the pilot physiology study. As Susan Chesney indicated, we will be able to accommodate your desire to use the same single room on the 3rd floor.

I have received the interim proposal and look forward to reviewing the final document. I understand you will be defending the proposal to your supervising committee in November 1998 and will apply for ethical approval in December 1998.

I look forward to discussing the research project with you in the future.

Sincerely,

Sue Chandler

Susan Chandler
(Acting) Patient Care Director
Women's Health Program

SC/mk

/mk
medvesrs.ltr

Royal Alexandra Hospital

Royal Alexandra Hospital Site
10240 Kingsway Avenue
Edmonton, Alberta

Tel: (403) 477-4111

Appendix I: Demographic Data for Microbiology Study

Data was reported in chapter four that compared groups by bather. Data were also compared by type of bathing solution to ensure that the demographic variables were similar. In the following tables the data are presented and demonstrate no differences in demographic variables between water and soap groups.

Table 16: Type of Birth and Bathing Solution

Type of Birth	Solution for Bathing		Total
	Water	Soap	
Normal	54	56	110
Forceps	3	2	5
Vacuum	4	6	10
Breech	1	1	2
Total	62	65	127

Table 17: Antibiotics in Labour and Bathing Solution

Antibiotics in Labour	Solution for Bathing		Total
	Water	Soap	
Yes	16	12	28
No	46	52	98
Unknown	0	1	1
Total	62	65	127

Table 18: Maternal Parity and Bathing Solution

Living Children including this infant	Solution for Bathing		Total
	Water	Soap	
1	25	29	54
2	23	26	49
3	8	9	17
4	4	1	5
5	0	0	0
6	1	0	1
7	1	0	1
Total	62	65	127

Table 19: Gestational age at birth and Birthing Solution

Gestational Age in Weeks	Solution for Bathing		Total
	Water	Soap	
37	3	8	11
38	13	10	23
39	24	22	46
40	16	19	35
41	5	6	11
42	1	0	1
Total	62	65	127

Table 20: Infant Gender and Birthing Solution

Gender of Infant	Solution for Bathing		Total
	Water	Soap	
Female	30	34	64
Male	32	31	63
Total	62	65	127

Table 21: Maternal Ethnicity and Birthing Solution

Ethnicity of Mother	Solution for Bathing		Total
	Water	Soap	
English Canadian	46	49	95
French Canadian	1	1	2
Polish	1	1	2
Ukranian	1	0	1
First Nation	3	2	5
Chinese	2	2	4
Asian	2	2	4
African	0	1	1
Vietnamese	5	1	6
Cambodian	1	0	1
Ghanian	0	1	1
Other	0	5	5
Total	62	65	127