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**PROPHYLACTIC CORD CARE:
IS IT NECESSARY?**

by

Karen Coyle

A Thesis Submitted in Partial Fulfilment of the
Requirements for the Award of

Bachelor of Health Science (Nursing). Honours

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at Edith Cowan University

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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

Prophylactic Cord care: Is it Necessary?

Karen Coyle

Edith Cowan University

ABSTRACT

Since the evolution of 'open' cord care in 1974, the umbilical cord of the newborn has been treated prophylactically with many different forms of antibacterial solutions. Recent studies have demonstrated that cord separation is facilitated by bacteria and many of the current treatments, such as the use of alcohol, actually delay separation. The purpose of this study was to compare cleaning the cord with alcohol to dry cord care, a method of cord care which is now being considered as an acceptable alternative to prophylactic umbilical cord treatment.

A convenience sample of 205 babies was taken from a small private maternity unit. A 2 x 2 factorial design was utilized to assess the effect of the independent variables of cord care and clamp removal time, on the dependent variable of cord separation time. In this study dry cord care was compared to the current practice of applying alcohol to the cord, and clamp removal times of 24 hours and 60 hours were considered.

A 2 x 2 ANOVA indicated that significantly later mean cord separation times were associated with the use of alcohol on the cord. Variations of cord clamp removal times had no significant effect on the mean cord separation times. Objective data collected on cord appearance indicated that cords treated with dry cord care were more often reported as being moist or sticky.

DECLARATION

"I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or a diploma in any institution of higher education; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text."

Signature.

Date.....October, 1991.....

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Karen Coyle

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Chapter 1

INTRODUCTION

Care of the umbilical cord until its separation is an important aspect of the care of the newborn. In most westernised countries the umbilical cord is usually treated prophylactically with some form of antibacterial solution or powder to prevent nosocomial infection. The risk of cross infection of the cord has declined in recent times with changing attitudes to post natal care, the advent of rooming-in and the care of the newborn (including cord care) being the responsibility of the mother. With these changes in mind it could be postulated: 'Is prophylactic cord care necessary?'

It is well documented in the literature that many current practices delay cord separation (Arad, Fabian, & Feinmesser, 1981; Lawrence, 1982; Barr, 1984; Salariya & Kowbus, 1988). Delay in cord separation has been identified as a source of anxiety for mothers (Lawrence, 1982; Arad et al. 1981) and mothers are often reluctant to perform cord care. If prophylactic cleaning of the cord is not necessary the alternative, to allow separation to occur naturally with minimal intervention, could then be seen as preferable for the mother and more cost-effective for the hospital.

The purpose of this study was to assess what effect dry cord care, minimal handling of the cord and earlier clamp removal time had on cord separation time and cord state

compared to the current practice of alcohol cord care and clamp removal on day three within the hospital of study.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

The exact mechanism of cord separation is still not fully understood, but "drying, infarction, bacterial contamination and granulocyte influx may all influence the time when it occurs" (Wilson, Ochs, Almquist, Dassel, Mause, & Ochs, 1985). Historically, various methods of cord care have been reported. Salariya & Kowbus (1988) report the practice in the United Kingdom prior to 1974 was to dust the cord with powder, then a pad and binder were applied and mothers and midwives were encouraged not to touch the cord. Since 1974 'open' cord care has been practised, the cord being left undressed and open to the air, the aim of care being to allow the cord to dry out and separate.

2.2 Umbilical Cord Separation

The mean cord separation time of the umbilical cord after birth varies greatly in reported studies, depending largely on the choice of cord treatment, which differs from one country to the next. Mean cord separation time has been reported as occurring anywhere between 5 - 17 days in various studies. Earlier cord separation times have been reported in studies based in India by Bhalla, Nafis, Rohatgi & Singh (1981), and a study in Israel by Naor, Merlob, Litwin & Wielunsky (1989). The mean cord separation times reported in these studies was 5.8 days and 6.36 days respectively.

Slightly later separation times have been reported from studies in the United Kingdom. In the United Kingdom, cord care policy varies from one health authority to the next (Mugford, Somchiwong & Waterhouse, 1986), most hospitals treating the cord prophylactically with antibacterial powders, antiseptic solutions or a combination of both. Studies by Lawrence (1982), Barr (1984), Mugford et al. (1986) and Salariya & Kowbus (1988) reported mean cord separation times between 6.29 days and 8.11 days depending on treatment used. In Australia prophylactic cord treatment consists of some form of alcohol application (Bourke, 1990). Two recent Australian studies reported mean cord separation times between 6.2 days and 8.73 days (Bourke, 1990, & Bailey, 1990).

Much later mean cord separation times have been reported in studies from the United States. Prophylactic treatment of the umbilical cord in the United States often consists of the use of triple dye in combination with other antibacterial/antiseptic solutions (Andrich & Golden, 1984). Wilson et al. (1985) reported a mean cord separation time of 15 days in a study in which the cord was treated with triple dye and alcohol. Similar findings with the use of triple dye were reported in other American studies by Novack, Mueller & Ochs (1988) and Gladstone, Clapper, Thorp, & Wright (1988), with mean cord separation time reported between 11.8 days and 17.4 days.

Many studies which investigate the umbilical cord are based on comparing various prophylactic treatments and their

effects on bacterial colonisation of the cord. A study by Andrich & Golden (1984), compared the use of bacitracin spray (antibiotic) to the use of triple dye application on the bacterial colonisation of the cord. This study found the use of bacitracin increased the colonisation rate of group B streptococcus and triple dye was associated with reduced colonisation of staphylococcal Aureus. Paes & Jones (1987) found similar findings when comparing the use of triple dye to alcohol. Increased incidence of Staphylococcus Aureus was found in the cords treated with alcohol. A study by Gladstone et al. (1988) compared six different cord treatments and found on culture that all cords, irrespective of treatment used, cultured bacteria. None of these studies used a control group to compare what bacterial colonisation would be present if no cord care were to be performed. Although conclusions were drawn as to which form of treatment reduces certain types of bacteria, none of the studies identified the clinical significance of the bacteria cultured and no correlation was done between bacterial colonisation and clinical infection.

In 1982, Lawrence reported on a cord study in which the use of water and sterzac (antibacterial powder) was compared to the use of alcohol and sterzac on the umbilical cord, and the effects on separation time. Results showed significantly more cords had separated by the end of the sixth day with the use of water and sterzac ($p < 0.05$). In view of the study findings, Lawrence (1982) hypothesised that umbilical cord separation may be facilitated by

bacteria and that total sterility may slow separation. These conclusions were not supported by bacteriological evidence.

The hypothesis put forward by Lawrence (1982), that cord separation is facilitated by bacteria, was supported in a study performed by Nystrom, Bygdeman, Henningsson, Tunnell & Berg (1985). This study compared bacterial colonisation of the umbilical cord in two groups of babies, each group being treated with a different type of antibacterial solution. The study found that the solutions used had no significant effect on bacterial colonisation. A similar percentage of babies in both groups cultured micro-organisms including staphylococcus Aureus. In this study it was noted that the median cord separation time was much shorter in the babies colonised with staphylococcus Aureus than those babies who had no bacterial growth in their umbilical cord (11 days as compared to 14.5 days). It was reported that colonised infants did not display umbilical infections any more frequently than non colonised infants.

A method of cord care which has been largely overlooked is that of dry cord care. Mugford et al. (1988) identified, through a survey, that this method is seldom practised in the United Kingdom. Dry cord care or 'no routine care' has been compared with alternative cord care methods in a number of research studies on cord care (Barr, 1984; Mugford et al., 1986; Salariya & Kowbus, 1988; Bourke, 1990; Bailey, 1990).

Barr (1984) examined the question 'To treat or not to treat?' In this study Barr (1984) examined the cord separation time in babies who had their cords treated with mediswabs (alcohol swabs) at every nappy change. A comparison group was then studied in which no cord care was performed unless the cord became soiled, in which case it was cleaned with water only. Earlier cord separation was demonstrated in the untreated group although these findings are limited in their generalizability to the sample.

Similar results were reflected in a study by Salariya & Kowbus (1988). This study assessed the effect of four different cord care regimes on cord separation time. The four regimes were: (a) No routine cord care; (b) Sterets (alcohol swabs) and sterzac powder; (c) sterets only; (d) sterzac only. A different treatment was performed on each of four wards. Significantly earlier cord separation was found in the no routine cord care and sterzac only groups. From this study the authors suggested that minimal handling of the cord may contribute to earlier cord separation time. From interviewing and observing mothers during the study the researchers found that the majority were cleaning the cord after changing the napkin without washing their hands regardless of initial instruction. In this study a high incidence of 'sticky' cords in all four groups was also reported. The majority of these were noted to have separated within three days of being reported as being sticky. Comments by Salariya & Kowbus (1988) suggest that the sticky cord may be a normal physiological process in the care of the open cord.

In 1986, Mugford et al. assessed the effect of numerous cord care treatments in relation to cord separation time and the effect of multiple treatments on the workload of community midwives. In this study the 'no treatment' group was not found to have a shorter cord separation time, but, on further investigation it was found many of these cords had been treated with spirit and a variety of other treatments which would have influenced the mean cord separation time, the results must therefore be considered inconclusive.

The use of prophylactic cord care to reduce bacterial colonisation has been shown to be ineffective in two recent Australian studies. Bourke (1990) found in her study that compared the use of cord spirit (70% Alcohol) to dry cord care, bacterial colonisation of the umbilical cords of the babies on discharge was much the same in both groups. Of the 26 swabs taken, the majority grew staphylococcus Aureus irrespective of treatment group, and only one swab from each group had no growth. In a study currently being undertaken at the Flinders Medical Centre (Harrington, Barclay, Conroy & Royal, 1991), early swab results indicate that bacterial colonisation is well established within 24 hours irrespective of the use of antimicrobials. This study is comparing two groups of babies, the cords in one group receiving no treatment whilst the others are treated with chlorhexidine in alcohol. Routine swabs on the 2nd and 3rd postnatal day so far demonstrate an equal distribution of the type of micro-organisms cultured across both groups (reported sample of 77 babies). Some of the

organisms cultured include Staphylococcus Aureus, staphylococcus epidermidis, streptococcus viridans, enterococcus, gram negative bacillus and proteus. To date none of the babies in the study have developed a clinical infection despite being colonised by potential pathogens.

Several studies (Bhalla et al., 1981; Novack et al., 1989; Bailey, 1990) have considered other variables which may influence cord separation time. Mode of delivery in some studies has been shown to be significant. Babies born by caesarian section have demonstrated a significantly later mean cord separation time than babies delivered vaginally in studies by Bhalla et al. (1981) and Novack et al. (1989). Bailey (1990) had similar findings although it was not reported whether the results were significant. These three studies found no correlation between birthweight and cord separation. The sex and gestation of the infant was not found to be significantly related to cord separation by Bhalla et al. (1981) and Novack et al. (1988). Bailey (1990) found in her study that cord separation was later in males than females, but the statistical significance was not reported.

2.3 Cord Clamp Removal Time

It is common practice in Australia and most westernised countries to clamp the cord immediately after delivery, approximately 1 - 2 cm from the abdomen, with a plastic cord clamp. The removal time of this clamp, as a variable in affecting separation, is not reported in any of the previous studies. It is assumed that the time of clamp

removal was a controlled variable in many of the studies as day of removal is not disclosed. Mugford et al (1986) outlined that the clamp was removed on the third day and not before. Clamp removal time was reported in Bourke's (1990) study as 24 hours and Bailey (1990) as anywhere between 24 hours and 3 days.

2.4 Conclusion

From the review of the literature it can be concluded that cord separation time is affected by the method with which the cord is cleaned. Recent studies have shown that the use of antibacterial solutions do not reduce the colonisation of the infant by potential pathogens such as *Staphylococcus Aureus*, yet their use delays cord separation time. The effect of the time of cord clamp removal on cord separation has not yet been established, and minimal studies have been done to describe the appearance of the separating umbilical cord. From the review of the literature the following research questions were developed.

2.5 Research Questions

1. Does dry cord care and minimal handling of the cord reduce cord separation time as compared to the current practice of cleaning with alcohol swabs at every napkin change?
2. Is cord separation time affected by the time of removal of the umbilical cord clamp?
3. Is there a difference in the appearance of the cord if it is treated prophylactically with alcohol?
4. Do the variables of type of delivery, birthweight, sex,

feeding regime, length of gestation and napkin type
influence the cord separation time?

Chapter 3
METHODS AND PROCEDURES

3.1 Design

The study utilised a 2 X 2 factorial design (Burns & Grove, 1987, p272). This type of design allowed the effect of the two independent variables to be examined, these being cord care method and clamp removal time. Within each independent variable two levels were manipulated, to assess the effect on the dependent variable of cord separation time as outlined in Table 3.1 below. This type of design allows the interaction between independent variables to be assessed.

Table 3.1
2x2 Factorial Design

Cord Clamp Removal	Cord cleaning type	
	Alcohol	Dry
24hrs	A	B
60hrs	C	D

3.2 Sample and Setting

This study was carried out in a small private maternity unit in Perth, Western Australia between the 6th March and the 5th June, 1991. A convenience sample of all babies born during the study period was utilised. A total of 284 babies were born whilst the study was in progress and 223

babies were included in the sample. All mothers were given the opportunity to allow their baby to participate in the study if their baby met the inclusion criteria. Babies were eligible for inclusion in the study if they were 36 weeks gestation or greater according to due date. Babies who required nursing in an isolette or who, for medical reasons, had to be nursed in double nappies and positioned on their stomachs were excluded from the study. Babies who required phototherapy or who were commenced on systemic antibiotics after being initially included in the study were withdrawn. The sample of 223 recruited babies was further reduced to 205 after 18 babies were withdrawn. 16 babies were removed from the study because they were commenced under phototherapy or were commenced on systemic antibiotics. One baby was excluded because the mother did not document the date and time of cord separation. Another baby was withdrawn because the cord was 'cut off' by the general practitioner whilst having a check for an unrelated problem. The final sample of 205 babies included three sets of twins. The birthweight of all babies in the study ranged from 2140 grams to 4740 grams. The sex distribution in the study was even with 103 males and 102 females.

3.3 Method

Four treatment regimes were designed to compare the effects of dry cord care with the current practice of using alcohol swabs, and the effect of two different cord clamp removal times, on cord separation. Random allocation to the treatment groups was rejected because the study was carried out in one ward area and four simultaneous cord care

methods would be difficult to implement and possibly resulting in poor compliance. The four treatment regimes were as follows:

Regime A: Alcohol cord care was performed. The cord clamp was removed 24 hours after delivery.

Regime B: Dry cord care was performed. The cord clamp was removed 24 hours after delivery.

Regime C: Alcohol cord care was performed. The cord clamp was removed 60 hours after delivery.

Regime D: Dry cord care was performed. The cord clamp was removed 60 hours after delivery.

Regime A was the first regime to be implemented and was continued until the sample reached 55, then regime B was commenced. Regime C & D followed systematically.

All midwives working in the ward area were made familiar with the study through inservice education by the researcher. Within 24 hours of delivery the midwife responsible for the patient explained the study to them, this explanation being followed up with a written explanation and consent form (Appendix A). Once consent was obtained, each baby was allocated a data assessment chart (Appendix B) and cord treatment was commenced according to the regime being utilised at that point in time. Details about the baby's time and date of birth, gestation, type of delivery, birth weight and sex were recorded on the data assessment chart. The date and time the cord was clamped was also documented on this chart. The mothers were instructed by the midwife about the type of cord care they were to perform.

Within this hospital the umbilical cord is clamped with a plastic hollister cord clamp immediately after delivery, approximately 1 - 2 centimeters from the abdomen, and then cut with sterile scissors. All babies are bathed within 6 hours of delivery and then on a daily basis. Infacare bathing solution is used in the bathwater as a soap agent. To reduce bacterial colonisation, all babies have antistaphylococcal cream (Hexachloraphane 30 g/L) applied on the first two days after their bath. All babies in the study wore a single cloth napkin folded and applied in such a way that the cord is left exposed to the air. All babies were positioned on their side in the cot. It is hospital policy that mothers and their babies are encouraged to room in, and the mothers are responsible for all their baby's needs including cord care.

Daily assessment of the state of the cord was performed by the midwife caring for the mother and the baby. All midwives were made familiar with the definition of terms (Appendix C) used on the daily assessment chart. Any variations in the treatment of the cord was also documented on this chart. Staff were instructed that suspected clinical infections of the umbilical cord were to be referred to the paediatrician and confirmed by bacteriological study. Cord separation details were also recorded in the space provided. On discharge, if the baby's cord was still insitu, the mother was asked to continue the cord care they had been performing in hospital. They were asked to record the date and time that cord separation occurred on the explanation letter as

indicated (Appendix A). The mother was informed that a midwife would phone within two weeks to obtain this information. Phone numbers were recorded on a number/name key. The midwife phoning the mother also enquired about the type of nappies that had been used after discharge, if the cord had been treated with any additional forms of treatment prior to separation and if there had been any problems with the cord.

3.4 Operational Definitions

Dry Cord Care: The base of the umbilical cord is cleaned with a dry cotton bud after the daily bath. No other cord care is carried out unless the cord becomes soiled, in which case the cord was cleaned with water only and thoroughly dried with a cotton bud.

Alcohol Cord Care: The base of the cord is wiped with a skin cleaning swab (70% Isopropyl alcohol) at every napkin change.

Cord Separation: Complete detachment of the umbilical stump from the abdomen.

3.5 Assumptions

The assumptions upon which this study were based included:

1. The environment in which the babies were nursed in hospital remained constant over the three month data collection period.
2. Cord care was carried out by the mothers/staff as dictated by the study.
3. Bacterial colonisation could have occurred without any signs of infection being present.

4. Inflammation around the umbilical cord and/or offensive odour may indicate the presence of infection.

3.6 Ethical Considerations

All mothers, after delivery, were given a letter explaining the study and asking them to sign an informed consent to allow their baby to participate (Appendix A). This letter made it clear that consent could be withdrawn at any time. Mothers who did not wish their baby to take part in the study carried out cord care as outlined by hospital policy. Upon discharge from hospital the top portion of the data assessment chart (Appendix B) was removed to maintain confidentiality. Permission to conduct this study was obtained from the Ethics Committee at Edith Cowan University, and from the Medical Advisory Committee of the hospital in which the study was conducted.

Chapter 4

FINDINGS

4.1 Introduction

Data was analysed using the statistical analysis system (SAS) package. To assess the effect of the independent variables of method of cleaning the cord and clamp removal time on cord separation, a two way analysis of variance (ANOVA) was applied to the completed data on mean cord separation times collated from each of the four groups. Simple statistics including means, standard deviation and frequencies were calculated to assist in analysis. The significance of the cord states reported on the data assessment chart (Appendix B) were analysed using chi square. Data collected on other variables which included type of delivery, birthweight, gestation, sex, nappy type and type of feeding were analysed between the two cord cleaning groups by appropriate *t* tests or correlation.

4.2 Effects of Cord Care and Clamp Removal Time on Cord Separation Time

Cord separation time was calculated using the following procedure. Mothers were asked to record the date and time that cord separation had occurred. Most mothers reported the time that they had found the cord loose in the nappy or gave the time between the last nappy change and time of discovery of cord separation. Times reported were rounded up to either 12 midday, 6pm, 12 midnight or 6am, to allow some consistency in estimation of time of cord separation. The actual cord separation time was then calculated by the number of completed quarter days since delivery. For

example, a baby who was born at 5pm on the 12th of the month, whose cord separation time was reported as 10am (rounded up to 12 midday) on the 21st of the month, would have a calculated cord separation time of 8.75 days (35 completed quarter days). Mean cord separation times were calculated from the data obtained from the mothers by telephone. All mothers in the study reported that they had continued the cord care they had been performing in hospital.

Table 4.1
Cord separation data according to treatment regime

TREATMENT REGIME	CORD SEPARATION TIME (DAYS)				
	n	mean	s.d.	minimum	maximum
Regime A alcohol/clamp 24hrs	51	11.22	3.75	3.75	22.5
Regime B dry/clamp 24hrs	54	8.97	2.60	4.25	14.75
Regime C alcohol/clamp 60hrs	51	10.01	2.99	4.50	18.5
Regime D dry/clamp 60hrs	49	8.72	3.07	3.50	17.5
All Babies	205	9.73	3.26	3.50	22.5

The mean cord separation time for the sample was 9.73 days. The means for each of the four treatment groups are outlined in Table 4.1. The two way analysis of variance procedure indicated a significant effect of type of cleaning on cord separation ($F(1,201) = 16.35, p <$

.05). Later separation times were associated with the use of alcohol on the cord. No significant effect was found with the different clamp removal times ($F(1,201) = 2.42, p > .05$) or interaction between clamp removal and cleaning type ($F(1,201) = 1.53, p > .05$). These data demonstrate that the main influence on separation time is cleaning type. Fig. 4.1 below is a graphical presentation of the means from each of the four study groups. This demonstrates that there is no interaction between the means of the alcohol cord care groups and the means from the dry cord group. For the purpose of the remaining analysis, therefore, data will be analysed in two groups, dry cord care group and alcohol cord care group, discounting clamp removal time as an influencing variable.

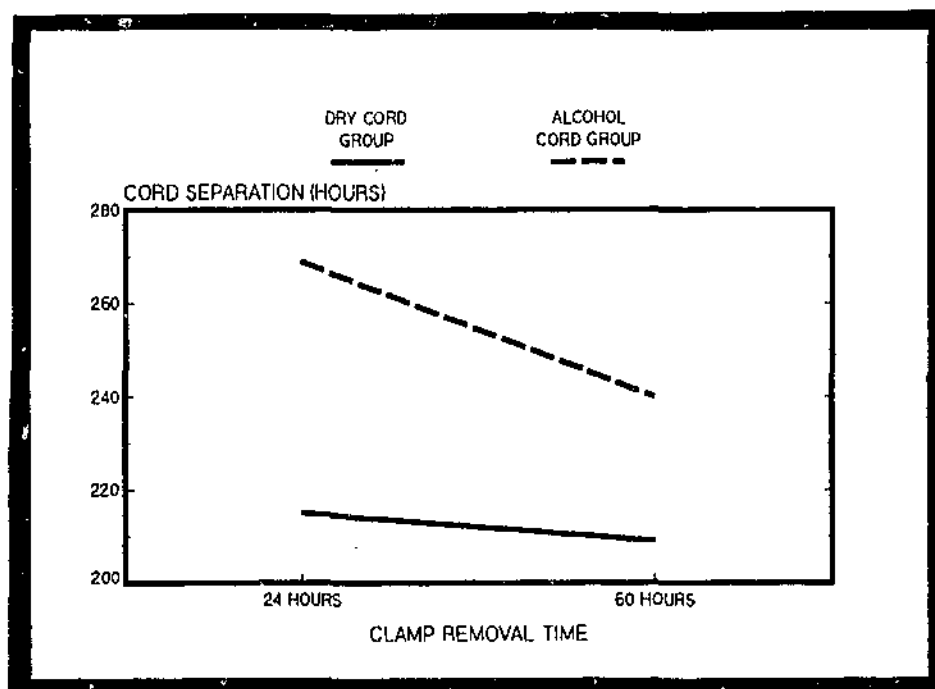


Figure 4.1
Mean Cord Separation Times

Table 4.2
Characteristics of Sample

Characteristic Description	Cord cleaning type	
	DRY	ALCOHOL
Sample size	103	102
Sex: Male	50	53
Female	53	49
Mean Gestation	39.5	39.5
Mean Birthweight	3396	3389

The characteristics of the two sample groups are outlined in Table 4.2. Both groups were very similar in size and sex ratio. The mean birthweight of each group is very similar and the mean gestation was identical in both groups. Since the groups are so similar in character, the differences found in cord separation between the two groups is unlikely to be due to differences in sex ratio, gestation or birthweight.

Table 4.3
Cord Separation Data

Category	Dry cord care			Alcohol cord care		
	n	mean separation	s.d	n	mean separation	s.d
All Babies	103	8.85	2.83	102	10.62	3.34
Sex						
Male	50	8.98	2.71	53	10.74	3.73
Female	53	8.73	2.95	49	10.49	3.11
Napkin						
Cloth	70	8.19	2.70	70	10.26	3.70
Combined	33	10.27	2.60	32	11.41	2.65
Feeding						
Breast	99	8.87	2.84	100	10.65	3.45
Artificial	4	8.37	2.85	2	8.88	1.59

Table 4.3 outlines the mean cord separation times according to type of cord care. The dry cord care group had a mean cord separation time of 8.85 days which is 1.77 days shorter than the alcohol cord care group, which had a mean separation time of 10.62 days. The dry cord care group had a median separation time of 8.75 days and a range of 3.5 - 17.5 days. The alcohol cord care group had a much broader range of 3.75 - 22.5 days and a median separation time of 10.13 days. The number of cords that separated on each postnatal day are represented in Figure 4.2. From this Figure it can be seen that all cords in the dry cord care group had separated by the fourteenth day except one.

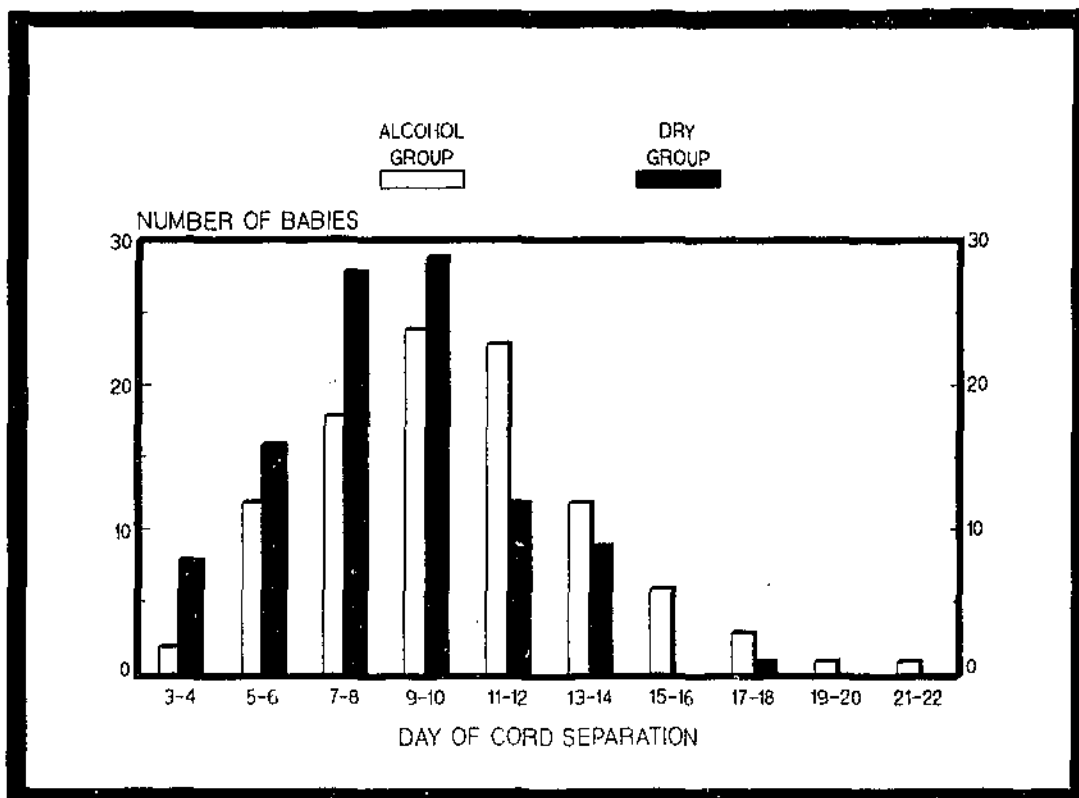


Figure 4.2
Day of Umbilical Cord Separation

Figure 4.3, below, outlines the cumulative frequency of cord separation in each treatment group. At the end of one week 24% of cords had separated in the alcohol cord care group compared to 37% in the dry cord care group. At the end of two weeks 90% of cords had separated in the alcohol cord care group compared to 99% in the dry cord care group.

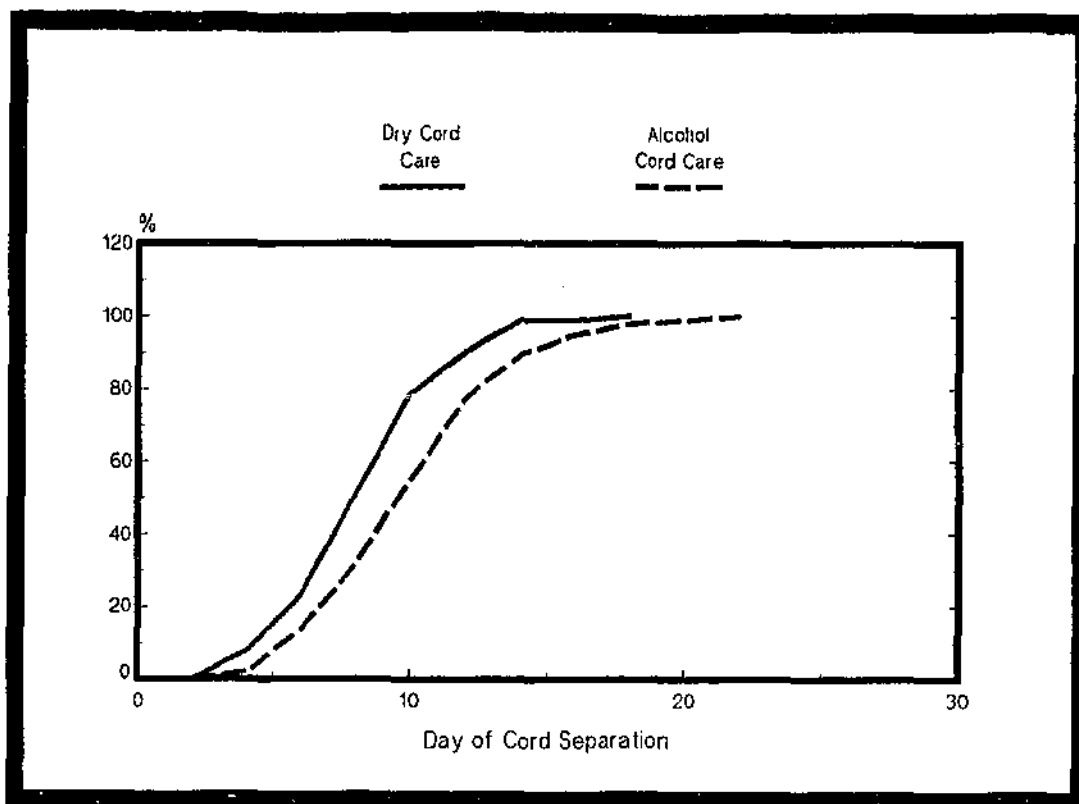


Figure 4.3
Cumulative Frequency of Days of Cord Separation

4.3 Effect of other Variables on Cord Separation Time

Data on other variables was collected to assess their effects, if any, on cord separation time. These data included type of delivery, sex of the baby, birthweight, gestation, nappy type used and method of feeding. In the sample of 205 babies it was found that 97% were breast fed. Because of the small percentage of babies that were artificially fed no analysis was done on this variable.

4.3.1 Type of Delivery

Table 4.4
Delivery Type and Mean Cord Separation

TYPE OF DELIVERY	Alcohol cord care		Dry cord care	
	n	days	n	days
Spontaneous Vertex	61	10.29	57	8.37
Vacuum Extraction	23	10.99	18	8.45
Forceps Delivery	5	9.90	4	9.66
Caesarean Section	13	11.78	24	10.08

Table 4.4 shows the four delivery types and associated mean cord separation times within the two cord treatment groups. A longer mean cord separation time was associated with babies born by caesarean section in both groups, but an analysis of variance found that there was no significant difference between the mean cord separation times reported for each delivery type, either for the dry group $F(3,99) = 2.41, p > .05$; or for the alcohol group $F(3,98) = 0.85, p > .05$.

4.3.2 Sex

The mean cord separation times according to sex in each cord cleaning group are outlined in Table 4.3. Within each cord cleaning group, t test analysis demonstrated no

significant differences in mean cord separation time between boys and girls for the dry group ($t(101) = 0.6572$, $p > .05$) or for the alcohol group ($t(100) = 0.3603$, $p > .05$).

4.3.3 Birthweight

In the alcohol cord care group, Pearson's correlation coefficient showed that there was no significant correlation between mean cord separation time and birthweight ($r = 0.04$, N.S.). In the dry cord care group a weak positive correlation ($r = 0.22$, $p < .05$) was identified between increasing birthweight and later cord separation time.

4.3.4 Gestation

Pearson's correlation coefficient showed, in both cord care groups, that there was no significant correlation between gestation and cord separation (dry cord group $r = 0.36$, $p > .05$; alcohol cord group $r = 0.04$, $p > .05$).

4.3.5 Napkin Type

In the hospital setting all mothers used cloth napkins. On discharge some mothers chose to use disposable napkins, and so were categorised as using combined napkin type. Table 4.3 outlines the mean cord separation time according to category of napkin used, within each cleaning group. In the dry cord care group, later mean cord separation time was associated with the use of a combined napkin type compared to cloth napkins alone ($t(101) = 3.6955$, $p < .05$). In the alcohol cord care group combined napkin use

was also associated with later mean cord separation time although this result was not found to be significant ($t(81.8) = 1.7857, p > .05$).

4.4 Effect of Cord Care on Appearance of the Umbilical Cord
As outlined on the data assessment chart (Appendix B) the cord was observed daily to assess if it was clean, dry, sticky, moist, bleeding, inflamed or offensive. These observations were conducted only while the baby was in hospital. The average stay in hospital was 6.5 days. It was noted by the researcher that not all of the babies' cords were observed every day, so collated data may not be totally reliable. No babies in the study were reported as displaying clinical signs of umbilical cord infection.

Table 4.5
Reported Appearance of the cord

State of Cord	Number of Babies						X ²	p
	Alcohol Group			Dry Group				
	NR	R	(%)	NR	R	(%)		
Moist/sticky	59	43	(42)	31	72	(70)	16.02	<.05
Bleeding	85	17	(17)	67	36	(34)	8.94	<.05
Inflamed	100	2	(2)	102	1	(.01)		
Offensive	100	2	(2)	96	7	(6)		

NR = Not Reported R= Reported

Table 4.5 outlines the cord states and the number of babies that had each state reported or not reported during their hospital stay. All cords were reported as clean and dry at some stage so these data were not included. During the period of hospitalisation, 36% of the cords treated with alcohol and 19% of the cords in the dry cord care group were never reported as moist, sticky, bleeding, inflamed or offensive. The terms moist and sticky were used interchangeably by many staff, so these two terms were combined. Chi square analysis was used to compare the reported frequencies between the two cord care groups. Chi square analysis was not applied to the cord states of inflamed and offensive because the expected frequencies within 50% of the cells was less than 5, so use of the test was not appropriate. Significantly more cords were reported as moist/sticky and bleeding in the dry cord care group than those in the alcohol cord care group.

4.5 Conclusion

In summary, this study found that the use of alcohol on the cord was associated with significantly later mean cord separation times than the cords treated by dry cord care. The time of clamp removal was not found to be statistically significant. The variables of delivery type, birthweight, sex and gestation were not found to have any significant effect on mean cord separation time. The use of disposable napkins was found to significantly delay cord separation in the dry cord care group. The cord states of moist/sticky and bleeding were reported more often in the dry cord care group.

Chapter 5

DISCUSSION

5.1 Introduction

The research questions posed in this study addressed the comparison of dry cord care and minimal handling of the cord to cleaning the cord with alcohol swabs. Variations in cord clamp removal time were also assessed. Other variables considered in the study included appearance of the cord, type of delivery, sex of the baby, birthweight, length of gestation and napkin type used. The reported findings are discussed below.

5.2 Cord Separation and the Effect of Cord Clamp Removal Time.

Cord clamp removal time as a variable which may affect cord separation time has not been considered in any of the previously cited studies although it was controlled for in many. In this study the comparison between clamp removal time at 24 hours and 60 hours was not found to have any statistically significant effect on cord separation time. Anecdotal data collected did suggest that some cases of bleeding were caused by leaving the clamp in situ for 60 hours. Some 'tearing' of the umbilical cord below the clamp was reported in two cases on the second day, related to pressure on the cord clamp. As the removal time of the clamp was not found to have any effect on cord separation, earlier removal time may be considered as more appropriate to prevent undue tension.

5.3 Cord Separation and the effect of cleaning method

Mean cord separation times in this study varied between 8.72 days and 11.22 days depending on treatment group (Table 4.1). In this study the use of alcohol on the cord was found to be associated with later mean cord separation times than the use of dry cord care. This supports findings in previous studies (Barr, 1984; Saliyara & Kowbus, 1988; Bourke, 1990 & Bailey, 1990) which have suggested that the use of alcohol may delay cord separation times.

In this study cords treated with alcohol had a mean cord separation time 10.62 days. This is longer than similar reported studies from Australia and the United Kingdom. Bourke (1990) reported a mean cord separation time of 8.04 days for cords treated with alcohol. Similar separation times of between 7.1 - 7.9 days have been reported by Mugford et al (1986) and Saliyara & Kowbus (1988). In a descriptive study by Bailey (1990), the hospital which used alcohol to treat cords, reported a mean cord separation time of 9.81 days. Similarly, the dry cord care group in the present study had a longer mean cord separation time of 8.85 days compared to 6.04 days reported by Bourke (1990); 7.52 days reported by Bailey (1990) and mean separation times ranging between 6.2 and 7.2 days reported by Barr (1984), Mugford et al. (1986) and Saliyara and Kowbus (1988).

The reason for the later mean cord separation times found in this study is hard to establish. The study groups used

by Bourke (1990) were very similar to those in this study. Obvious differences between Bourke's study and this study were that daily cord ties (no description of the material used to tie the cord was given) were applied to the cords treated with alcohol once the cord clamp was removed (these were not applied to the dry cord group), and disposable napkins were utilised whilst the babies were in hospital. Bourke did not report the use of any type of antistaphylococcal measures. The use of antistaphylococcal cream as a routine on all babies in this study could have contributed to the later mean cord separation times found as cord separation is believed to be assisted by bacterial colonisation (Wilson et al., 1985 and Novack et al. 1989). In the descriptive study by Bailey (1990) mean cord separation times were also longer than those reported by Bourke (1990). Both the hospitals in Bailey's (1990) study reported utilising some form of antistaphylococcal measures. None of the studies from the United Kingdom (Barr, 1984; Mugford et al., 1986 & Saliyara & Kowbus, 1988), which also displayed shorter mean cord separation times than this study, reported using any antistaphylococcal measures.

In the current study all babies were bathed daily while hospitalised and mothers were encouraged to continue this practice at home. In a study by Bhalla et al (1975), it was found that babies that were bathed daily had longer cord separation times than babies who were not bathed

during the study, irrespective of cord treatment. It was suggested as a result of these findings that wetting of the cord may delay separation. In the studies by Bourke (1990) and Bailey (1990) babies were reported as being bathed daily. Studies from the United Kingdom do not report if daily bathing was standard practice, although Saliyara & Kowbus (1988) identified that babies were not always bathed daily. The ritual of daily bathing is accepted practice in this country but cannot be discounted as a factor affecting cord separation time.

In the present study dry cords were cleaned a minimum of once per day and then more often if required. Attempts were made to monitor the frequency of alcohol cord care but maternal compliance at reporting this data was poor so a comparison of different frequencies of cord care could not be made. Mothers were instructed to clean the cord with every napkin change so the frequency of care depended largely on how often the baby required a napkin change. The frequency of cord care within the study groups would have been similar to that in Bourke's (1990) study so this variable should not have had a great bearing on the cord separation times, when comparing the two studies. Frequency of cord care has been identified as having an effect on cord separation time in some studies. Bailey (1990) found on analysis of the group of babies who had their cords treated by dry cord care, that cords which were left untouched (no care) had a shorter separation time than cords which were cleaned with every napkin change. Bailey (1990) also observed that in the group of babies that had

their cords treated with alcohol, separation times increased with more frequent cleaning of the cord. Bailey suggests from these findings, that frequent alcohol use reduces bacterial contamination and resultant leucocyte response, interfering with the normal separation process, which leads to longer cord separation times.

The present study contained three sets of twins. Two sets were in the alcohol cord care group. The first set were both born by spontaneous vaginal delivery and were both boys. Twin 1 (birthweight 2430 grams) had a cord separation time of 9.75 days, compared to twin 2 (birthweight 2350 grams) who had a cord separation time of 15.75 days. The other set of twins were also both male, Twin 1 (delivered by vacuum extraction, birthweight 3010 grams) had a cord separation time of 9.25 days, twin 2 (delivered by Neville Barnes forceps, birthweight 2940 grams) had a cord separation time of 9.0 days. It is not known if these sets of twins were monozygotic. In the dry cord care group there was one set of twins, both delivered by caesarean section. Twin 1 (male, birthweight 2260 grams) had a cord separation time of 8.0 days compared to twin 2 (female, birthweight 2340 grams) who had a cord separation time of 12.25 days. The extreme differences between cord separation times of 2 of the sets of twins is difficult to explain. The first set described were the same sex, had the same type of delivery and were similar birthweight, yet there was a six day difference between cord separation time. The last set of twins described were different sexes but were again similar in birthweight and

type of delivery, yet cord separation varied by more than four days. No conclusion can be drawn from such a small sample of twins, but perhaps it does indicate that there are other variables yet to be identified which affect the separation of the umbilical cord.

5.4 Cord Separation and the Effect of Delivery Type

Within both cord care groups a later mean cord separation time was associated with delivery by caesarean section (Table 4.4), although this was not found to be statistically significant. Bhalla et al. (1975) found in a sample of 840 babies that cord separation was significantly longer in babies delivered by caesarean section compared to those delivered vaginally. A study by Novack et al. (1989) had similar findings with babies born by caesarean section having a mean cord separation time three days longer than babies born vaginally. Novack et al. (1989) suggests the reason for this delay may be related to the decreased bacterial contamination of babies born by caesarean section, which results in a decrease in the number of leucocytes attracted to the cord.

5.5 Cord Separation and the Effect of Sex

In this study the mean cord separation time was found to be only slightly later for males as compared to females within each treatment group, although this was not found to be statistically significant. Bailey (1990) reported that males had later mean cord separation times than females. The mean differences were less than one day and the statistical significance was not reported. Many of the

other studies, previously cited, reported sex distribution but the effect of the babies sex was not determined.

5.6 Cord Separation and the Effect of Birthweight

No strong correlation was found in this study between birthweight and cord separation time. Studies by Bhalla et al. (1975) and Novack et al. (1989) also failed to demonstrate any relationship between birthweight and cord separation time. These consistent findings indicate that the birthweight of the baby has minimal effect on cord separation time.

5.7 Cord Separation and the Effect of Length of Gestation

This study demonstrated no correlation between length of gestation and cord separation time. Other studies by Bhalla et al (1975) and Novack et al (1989), which correlated gestation with cord separation times, also found no correlation between the two, indicating that the length of gestation has little or no bearing on cord separation time.

5.8 Cord Separation and the Effect of Napkin type

All babies in this study were initially placed into cloth napkins whilst in hospital. The average hospital stay was 6.5 days. Approximately 30% of mothers chose to use disposable napkins after discharge. Within the dry cord care group (Table 4.3), the mean cord separation time for babies who fell into the combined napkin category was 10.27 days, which was much later than the mean cord separation time of 8.85 for the dry cord group. Babies who remained

in cloth napkins had a mean cord separation time of 8.19 days. This difference between these two groups was statistically significant and suggests that the use of disposable napkins may have some effect on delaying cord separation. Within the alcohol cord care group babies within the combined napkin group had a later mean cord separation time of 11.41 days compared to 10.26 days for babies who were left in cloth napkins. These values, however, were not statistically significant. Bailey (1990) found that later cord separation times were associated with disposable napkins. It is interesting to note that in the study by Bourke (1990) all babies were nursed in disposable napkins, and this study recorded very early mean cord separation times overall. These findings indicate that the effect of disposable napkins on cord separation time needs to be further investigated.

5.9 Appearance of the Separating Umbilical Cord

Few studies have been reported which to describe the appearance of the cord during the physiological process of separation. In this study an attempt was made to describe the state of the cord each day while the babies were hospitalised. All staff were made familiar with cord terminology (Appendix C) and assessed the cord daily. It was noted, while analysing data, that not all cords were assessed every day. From the recorded data, 36% of cords in the alcohol cord care group were reported as being clean and dry during the entire observation period compared to 19% of the dry cord care group. Significantly more cords were reported as sticky and moist in the dry cord care

group (Table 4.5) compared to the alcohol cord care group during the observation period. Irrespective of the use of alcohol, 42% of cords in the alcohol group were reported as being sticky/moist at some time. Saliyara & Kowbus (1988) in their study attempted to describe the state of the cord prior to separation. They found that, of the total sample, 68% of cords were described as either moist, sticky or smelling prior to separation. Saliyara & Kowbus (1988) noted in this study that of the cords reported as moist or sticky, 75% had separated within three days of being reported as such. Conclusions drawn by Saliyara & Kowbus (1988, p75) suggest that the "sticky cord may be normal to the process of separation in today's 'open' method of care."

From the data collected on the appearance of the cord in the present study and the reported findings in the study by Saliyara & Kowbus (1988), it appears that the frequent use of alcohol can make the cord appear cleaner and reduce stickiness, but it has to be questioned whether its use, which appears to delay cord separation, is actually interfering with the normal physiological process of cord separation in which a sticky/moist appearance is normal.

Bleeding around the cord was another cord state that was reported significantly more times in the dry cord care group than in the alcohol cord care group. Approximately 34% of cords in the dry cord care group were reported as bleeding at some stage compared to 17% in the alcohol cord care group. It could be assumed that some loss of old blood from a separating cord which is comprised of

collapsed blood vessels be expected, and that bleeding is a minor complication which can be anticipated as part of the normal physiological process of cord separation.

During the study no babies were reported as displaying any signs of clinical infection. Three cords were reported as inflamed during the study period. Comments supporting these observations suggested that the red areas were related to pressure on the cord clamp from the napkin marking the skin. These reported inflamed areas were not associated with any offensive smell or pyrexia and all resolved within 24 hours with repositioning of the cord clamp/napkin. Nine babies in the study were reported as having an offensive cord. All of these were reported after day 5 and were associated with the cord being covered by a urine saturated napkin. All were resolved quickly (within 24 hours) by cleaning the cord with the regime dictated by the study and repositioning the napkin to expose the cord to the air. None of the offensive cords warranted a swab for microscopy after being assessed by the paediatrician. One cord in the dry cord group was cleaned with alcohol once only and sprayed with neotracin spray because the mother was being discharged. When contacted she reported no further problems and cord separation three days later. A large percentage of the offensive cords may have been prevented with better education of the mothers in regard to application of napkin.

Chapter 6

Conclusions, Limitations and Recommendations

6.1 Introduction

This study has examined cord separation time in newborn infants in relation to type of cord treatment, cord clamp removal time and other identified variables. From this examination conclusions are drawn, recommendations for further research are identified and implications for nursing practice are presented.

6.2 Conclusions

Conclusions from this study will be drawn by summarising the answers to the research questions which guided the study. The first question was as follows: Does dry cord care and minimal handling of the cord reduce cord separation time compared to the current practice of alcohol swabs at every napkin change? This study found that significantly more cords had separated earlier in the dry cord care group and that 99% of cords in this group had separated by the 14th day. The second question posed was: is cord separation time affected by the time of removal of the umbilical cord clamp? This study found no significant effect of earlier umbilical cord clamp removal time (24 hours) compared to current practice (60 hours). The third question posed was: Is there a difference in the appearance of the cord if it is treated prophylactically with alcohol? This study concluded that the umbilical cord treated prophylactically with alcohol may appear cleaner than the cord which has minimal intervention, but it is questioned by this researcher whether this treatment

may be interfering with the normal physiological process of cord separation. The fourth question posed was: Do the variables of type of delivery, birthweight, sex, feeding regime, length of gestation and napkin type influence the cord separation time? This study was unable to assess the effect of type of feeding on cord separation because of the low number of mothers who did not breast feed. The variables of sex, length of gestation, type of delivery and birthweight were not found to have any significant effect on mean cord separation time in this study. The variable of napkin type could not be accurately assessed in this study, but findings within the dry cord care group did indicate that the use of disposable napkins delayed cord separation time.

6.3 Limitations of this Study

The researcher acknowledges that cord care may not have always been carried out by the mothers as dictated by the study and that self reporting of alternative treatments to the cord may not have been disclosed in order to report favourable child care practices to the researcher.

Accurate assessment of the cord state was difficult because the patients period of hospitalisation varied, daily observation of the cord was not always carried out and different staff may have interpreted cord states differently in spite of definitions provided. An accurate description of the appearance of the separating umbilical cord is therefore not possible from this study but findings could be used as a guide as to what to expect.

One variable which was unable to be controlled after discharge was the environment to which the babies were discharged. The study period (three months) was a relatively short time span. The order of the cord regimes implemented allowed the alcohol and dry cord care groups to be alternated twice evenly over the study period. Clamp removal time is more likely to have been the main variable influenced by the temperature differences between March and June, with clamp removal at 24 hours conducted in the first half of the study and clamp removal at 60 hours conducted in the second half of the study. As the clamp removal time was not found to have any significant affect on the mean umbilical cord separation time it is considered that the temperature variations did not have any great influence on the study.

Results from this study are not able to be generalised to the whole population of babies in Perth as it was carried out in a private hospital which attracts clients from higher socio economic groups, which must be considered as detracting from the heterogeneity of the population.

6.4 Implications for Nursing Practice

Findings from this study confirm the findings of other studies which suggest that the use of alcohol delays cord separation. The reason for prophylactic use of alcohol in modern post natal care remains unclear. The implementation of dry cord care as a routine would have a number of advantages. The principles of dry cord care would encourage minimal cord handling of the cord by patients and

staff and enhance earlier cord separation. The cost saving to the hospital if alcohol swabs were not used could run into thousands of dollars per year.

The implementation of dry cord care would require thorough education of the staff in the hospital and the community. In particular, regarding the fact that cords treated in this way may more frequently have a sticky/moist appearance and bleeding may occur as a minor complication, than when cords were treated with alcohol. It is important that patients are also educated about the normal appearance of the cord and the clinical signs of infection. The education of staff/parents about the state of the cord would prevent a large percentage of cords being unnecessarily 'cleaned' with alternative preparations because of the misconception that the presence of stickiness is associated with the cord being 'dirty' and not cleaned properly rather than as a normal physiological process.

Knowledge of the mean cord separation times found in this study will be helpful for staff when educating patients about when they can expect the cord to separate. The anecdotal data in this study indicates that it may be beneficial to remove the cord clamp earlier than it is currently performed to prevent cord 'tearing' and pressure around the umbilicus.

6.5 Recommendations for Further Research

It would be useful to see a similar study carried out in a larger teaching hospital in Perth, to confirm the findings of this study across all socio economic groups. The full effect of the use of disposable napkins requires further investigation. It is recommended that this variable be controlled in further studies and an experimental design incorporating cloth versus disposable napkins be utilised.

The normal physiological process of cord separation has yet to be accurately described by any of the previous research studies. There is a large gap to be filled here, with a descriptive study being indicated. Such a study should involve close observation of the cord until separation. The cord would need to be observed more than once a day, and accurate assessment of inter rater reliability of the observers would need to be carried out. This type of study would be invaluable to patient and staff education.

The continued prophylactic treatment of the umbilical cord with alcohol as routine practice in current post natal care has been questioned by this study. The findings of this study demonstrate that the use of dry cord care enhances earlier cord separation without any increased incidence of signs of clinical infection. From the data shown in this study it can be seen that dry cord care, which largely allows nature to take its course, is an acceptable alternative method of cleaning the umbilical cord of the newborn baby.

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Appendix A

RESEARCH PROJECT - Care of baby's Cord

Dear Mother,

The midwives at Glengarry hospital are currently doing some research on the care of the umbilical cord in newborn babies. Care of the cord differs from hospital to hospital and from country to country. Our study will compare two different methods of treating the cord and the effect these methods have on the time the cord takes to fall off. Both these methods are recognised as safe practices of treating the cord.

Each month a different method of cleaning the cord will be implemented and assessed. Your midwife will be able to tell you which method is currently being used. The cord will be closely observed by the midwives during your stay and observations will be recorded on an observation chart which will be on your baby's cot. If your baby's cord has not fallen off by the time you are discharged we ask that you continue to clean the cord the way you have been doing in hospital. A midwife will telephone you within two weeks after discharge to obtain the date and if possible the time your baby's cord separated. Please record this information in the space provided below. If you have any questions please do not hesitate to ask any of the staff or myself (the undersigned).

To allow your baby to participate in the study we require that you sign a consent form. Consent is purely voluntary and you can withdraw consent at any time. The data collected will remain strictly confidential and your baby's identity will remain anonymous in any research reports or publications of the study. If you do not wish for your baby to participate in the study then the cord will be cleaned according to hospital policy.

If you would like a copy of the results of the study please provide a self addressed, stamped envelope in the box provided at the nurses desk. Thanking you for your consideration.

Date cord fell

off:

Karen Coyle
(Research co-ordinator)
(Phone 307 6724)

Approximate Time:

RESEARCH PROJECT - Care of Baby's Cord

I _____

of _____

consent to my baby _____

being included in the research project outlined above. My baby's involvement has been fully explained to me and I understand that I can withdraw my consent at any time.

signed _____

Witness _____

Date _____

APPENDIX B

NAME

UNIT NUMBER

[THIS PORTION TO BE REMOVED POST DISCHARGE]

UMBILICAL CORD RESEARCH PROJECT

HISTORY OF NEONATE:

Date of Birth:

Time of Birth:

Gestational Age:

Birth Weight:

Type of Delivery:

Sex:

Type of Feeding:

CORD CARE REGIME PLAN 'A', 'B', 'C' OR 'D' WILL BE INSERTED HERE

DAILY ASSESSMENT OF CORD BASE

[Tick Boxes as Applicable]

DATE	DAY	CLEAN	DRY	MOIST	STICKY	BLEEDING	OFFENSIVE	INFLAMED	NUMBER OF TIMES CLEANED	REMARKS (INCLUDE ALTERNATIVE TREATMENTS, SWABS, ETC.)
	0									
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									
	10									
	11									
	12									
	13									
	14									

EVENT RECORD	DATE		TIME				
	CORD CLAMPED				CORD SEPARATION		
CORD UNCLAMPED							

APPENDIX C**Definition of Terms
of Cord States**

Sticky: covered with a viscous substance at the base of the cord.

Moist: saturated with or suggestive of moisture through the whole cord.

Dry: cord is not moist or wet, lacking moisture.

Bleeding: to lose or emit blood from the cord.

Inflammation: red undurated area on the skin surrounding the base of the cord.

Offensive: unpleasant to the senses (smell)