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Umbilical Cord Care - Impact of National Recommendations

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Abstract

Objectives –To analyze the current umbilical cord (UC) care practice in Slovenia and to evaluate the impact of national UC care recommendations by comparing the UC care practice before and after their introduction. **Materials and Methods** – A questionnaire covering the complete UC care was sent to medical nurses and midwifes involved in UC care in primary-level pediatric centers, health visiting and parent education services (outpatient group) and secondary and tertiary-level pediatric centers (inpatient care group) in Slovenia. Three different clinical conditions of the newborn's umbilicus, i.e. healthy umbilicus (HU), umbilicus at risk (RU) and unhealthy umbilicus (UU) were used. The inpatient and outpatient groups and UC care in 2013 and 2021 were compared. **Results** – The sample included 396 respondents from all Slovenian regions. The odds for using UC care protocol in 2021 were 2.6 times higher compared to 2013 (P<0.001). The UC care of HU changed: the dry UC care became less frequent (P<0,001), the use of normal saline solution increased and the use of ethanol solution decreased (P<0.001). The use of ethanol solution for UU decreased (P<0.001) and the use of octenidine increased more than 200 times (P<0.001). **Conclusions** – The implementation of national recommendations significantly influenced the UC care in Slovenia. The current UC care practice is more unified and consistent with international recommendations. The adjusted UC care, depending on the clinical condition of the newborn's umbilicus, puts additional value to these recommendations. Further refinements of the UC care protocol should emphasize the use of dry UC care.

Key Words: Newborn ▪ Umbilical Cord ▪ Umbilicus ▪ Nursing Care ▪ Antiseptics.

Introduction

The basic principle of umbilical cord (UC) care is to keep it clean and dry, as this provides the fastest and safest UC healing. However, there are many different clinical practices of UC care in different parts of the world, including developed countries, leading to confusion among nurses, physicians and parents (1). In addition, there are several conditions that alter the natural UC healing process, causing important complications and requiring adjustments to care.

This was the case as well in Slovenia till 2014, when the first national recommendations for UC care were published. These recommendations defined three different clinical conditions of the newborn's umbilicus, i.e. healthy umbilicus (HU), umbilicus at risk (RU) and unhealthy umbilicus (UU), based on the presence or absence of umbilical inflammation, bleeding, polyp, UC stump separation time and umbilical wound healing, as all these conditions affect the newborn's umbilical healing process and consequently UC care (2). Secondly, the recommendations proposed adjusted UC care, i.e. dry cord care or the use of normal saline solution once daily for HU and the use of antiseptic solution three times daily for RU and UU.

The objective of this study was to analyze the current UC care practice in Slovenia and to evaluate the impact of national UC care recommendations by comparing the UC care practice before and after their introduction.

Methods

Design

The study was conducted during March 2021. A web-based questionnaire comprising 150 questions covering socio-demographics and UC care from birth to complete healing of the umbilical wound was sent to medical nurses and midwifes involved in UC care in primary, secondary and tertiary-level pediatric medical centers, health visiting services and parent education services in Slovenia. The responders were assigned into two groups according to the type of patient care; the outpatient care group included those working in primary-level pediatric centers, health home visiting services and parent education services, while the inpatient care group included those working in secondary and tertiary-level pediatric centers. Three different clinical conditions of the newborn's umbilicus, i.e. HU, RU and UU were used. The definitions previously described were applied (2). The definition of HU included all the following: absence of redness, swelling, purulent and foul-smelling discharge, absence of major bleeding, absence of umbilical polyp, UC stump separation time less than two weeks and nonpurulent discharge lasting less than two weeks after UC stump separation. The definition of RU included at least one of the following: the presence of redness without swelling, purulent and foul-smelling discharge, UC stump separation time more than two weeks and the presence of nonpurulent discharge lasting more than two weeks after UC stump separation. The definition of UU included the presence of at least one of the following: redness, swelling, purulent and foul-smelling discharge, major bleeding and umbilical polyp.

Ethics Statement

The study was approved by the National Medical Ethics Committee (Number 170/09/13).

Statistical Analyses

The frequencies and percentages were calculated for the categorical variables and the mean, median and standard deviation (SD) for the numerical variables. The inpatient and outpatient UC care groups and the UC care in year 2013 and 2021 were compared using the univariate logistic regression analysis. The significance level was set at the P-value <0.05. Statistical analysis was performed using the IBM SPSS Statistics 27.0 software (SPSS Inc., Chicago, IL, USA).

Results

The survey was carried out in March 2021. The sample included 396 respondents equally distributed from all Slovenian regions, though not all of them answered all the questions. The average age (median; SD) of the respondents was 43.8 years (43; 9.7) and their average working experience (median; SD) was 19.5 (19; 11) years. There were 161 (41.1%) respondents from health home visiting services, 145 (37.0%) from maternity hospitals, 74 (18.9%) from primary-level pediatric centers, 30 (7.7%) from tertiary-level pediatric centers, 25 (6.4%) from secondary-level pediatric centers and 22 (5.6%) from parent education services. There were 65 (16.8%) respondents working at two different areas at the same time, although either outpatient or inpatient.

Umbilical Cord Care in Inpatient and Outpatient Care Group

The national UC care protocol was more commonly used in the outpatient care group; the odds for using it were more than two times higher than in the inpatient care group (OR 2.233 (95% CI 1.084; 4.560), P=0.029). Almost a fifth (19.4%) of respondents from the inpatient care group were not following the national protocol, compared to the outpatient group, where the noncompliance with the protocol was much lower (9.7%).

Handwashing before UC care was more commonly performed in the outpatient care group (OR 2.371 (95% CI 1.354; 4.152), P=0.003), thought the inpatient care group was more rigorous in disinfecting hands (OR 0.067 (95% CI 0.009; 0.501),

P=0.009), performing it in more than 99%. No differences in the dry UC care between the groups were found (P=0.071). Regardless of the group, only HU was managed by the principles of dry UC care.

The normal saline solution was the most used solution for the HU care, yet it was more frequently used in the outpatient care group (OR 0.428 (95% CI 0.215; 0.851), P=0.016). In both groups the octenidine solution was the most used solution for the RU and UU care (49.5% and 51.0%, respectively), followed by the ethanol solution (24.7% and 28.1%, respectively) and chlorhexidine solution (8.8% and 9.4%, respectively). No differences were found in the use of any disinfectant solution used for RU and UU care between the groups. The odds for using one of the disinfectant solutions instead of the normal saline solution for HU care were higher in the inpatient care group (OR 0.428 (95% CI 0.215; 0.851), P=0.016).

Comparing the frequency of HU, RU and UU care, no differences were found between the inpatient and outpatient care group (P=0.941). The frequency of HU care was mostly done once per day in both groups (79.3% and 72.1%, respectively) without significant difference. The UC care of RU was done three times daily in 53.1% in the inpatient care group and in 44.7% in the outpatient care group. The UC care of UU was done more than three times daily in 63.0% in the inpatient care group and in 66.3% in the outpatient care group.

The overall comparison of UC care between the inpatient and the outpatient care group in the year 2021 is presented in Table 1.

Table 1. Umbilical Cord Care in the Inpatient and the Outpatient Care Group in 2021*

Umbilical cord care	Inpatient	Outpatient	OR‡	P‖
	N (%)†	N (%)	(95% CI§)	
Use of UC¶ care protocol (N=257)	(N=103)	(N=154)		
Yes	83 (80.6)	139 (90.3)	2.233 (1.084; 4.560)	0.029
No	20 (19.4)	15 (9.7)		
Handwashing before UC care (N=261)	N=107	N=154		
Yes	68 (63.6)	124 (80.5)	2.371 (1.354; 4.152)	0.003
No	39 (36.4)	30 (19.5)		
Hand disinfection before UC care (N=261)	N=107	N=154		
Yes	106 (99.1)	135 (87.7)	0.067 (0.009; 0.501)	0.009
No	1 (0.9)	19 (12.3)		
Dry UC care (N=259)	N=105	N=154		
Yes	8 (7.6)	4 (2.6)	3.093 (0.907; 10.557)	0.071
No	97 (92.4)	150 (97.4)		
Solution for HU** care (N=196)	N=82	N=114		
Normal saline solution	57 (69.5)	96 (84.2)		
Ethanol solution	6 (7.3)	6 (5.3)	0.428 (0.215; 0.851)	0.016
Chlorhexidine solution	1 (1.2)	1 (0.9)		
Octenidine solution	18 (22)	11 (9.6)		
Solution for RU†† care (N=193)	N=80	N=113		
Normal saline solution	12 (14.8)	20 (17.7)		
Ethanol solution	17 (21)	31 (27.4)	1.177 (0.665; 2.083)	0.577
Chlorhexidine solution	9 (11.1)	8 (7.1)		
Octenidine solution	42 (51.9)	54 (47.8)		

Continuation of Table 1. Umbilical Cord Care in the Inpatient and the Outpatient Care Group in 2021*

Umbilical cord care	Inpatient N (%)†	Outpatient N (%)	OR‡ (95% CI§)	P‖
Solution for UU‡‡ care (N=191)	N=80	N=111		
Normal saline solution	7 (8.6)	14 (12.6)		
Ethanol solution	19 (23.5)	35 (31.5)	1.149 (0.838; 2.654)	0.174
Chlorhexidine solution	8 (9.9)	10 (9)		
Octenidine solution	46 (56.8)	52 (46.8)		
Frequency of HU care (N=186)	N=82	N=104		
Once daily	65 (79.3)	75 (72.1)		
Twice daily	11 (13.4)	15 (14.4)	1.970 (0.722; 5.377)	0.186
Three times daily	4 (4.9)	9 (8.7)		
>Three times daily	2 (2.4)	5 (4.8)		
Frequency of RU care (N=184)	N=81	N=103		
Once daily	4 (4.9)	8 (7.8)		
Twice daily	20 (24.7)	22 (21.4)	1.025 (0.501; 1.941)	0.941
Three times daily	43 (53.1)	46 (44.7)		
>Three times daily	14 (17.3)	27 (26.2)		
Frequency of UU care (N=185)	N=81	N=104		
Once daily	2 (2.5)	2 (1.9)		
Twice daily	1 (1.2)	1 (1)	1.295 (0.254; 6.592)	0.756
Three times daily	27 (33.3)	32 (30.8)		
>Three times daily	51 (63.0)	69 (66.3)		

*Univariate logistic regression analysis; †Categorical variables presented as frequency (percentage); ‡Odds ratio; §Confidence interval; ‖P-value; ¶Umbilical cord; **Healthy umbilicus, ††Umbilicus at risk; ‡‡Unhealthy umbilicus.

Comparison of Umbilical Cord Care in 2013 and 2021

The percentage of respondents not using the UC care protocol dropped from 42.9% in the year 2013 to 22.0% in the year 2021 and of those using the protocol increased from 57.1% to 78.0%, respectively. The odds for using the UC care protocol in the year 2021 were 2.6 times higher compared to the year 2013 (OR 2.664 (95% CI 1.839; 3.860), P<0.001).

No differences in handwashing before UC care was noted between the years 2013 and 2021. However, there was an important increase in hand disinfection in the year 2021 (OR 0.498 (95% CI 0.281; 0.881), P=0.017).

The dry UC care became less frequent in 2021 (OR 0.305 (95% CI 0.155; 0.601), P<0.001). On the other hand, the use of the normal saline solution for the HU care increased from 51.4% to 78.1% and at the same time the use of ethanol solution markedly decreased from 45.7% to 6.1%. The odds for using ethanol solution for HU care distinctly decreased as well (OR 0.073 (95% CI 0.038; 0.139), P<0.001). Concurrently, the use of octenidine solution also increased from 0.5% to 14.8% during the same period (OR 35.946 (95% CI 4.846; 266.647), P<0.001). There was large shift in the use of ethanol and octenidine solution for UU care. The use of ethanol solution dropped by 50.3% and the use of octenidine increased by 50.5%. Therefore, the odds for using ethanol solution decreased significantly (OR 0.056 (95% CI 0.033; 0.094), P<0.001) and the odds for using

octenidine solution increased by more than 200 times (OR 208.511 (95% CI 28.64; 1518.01), P<0.001).

The overall comparison of umbilical cord care between the year 2013 and the year 2023 is presented in Table 2.

Table 2. Umbilical Cord Care in 2013 and 2021*

Umbilical cord care	2013	2021	OR‡	P‖
	N (%)†	N (%)	(95% CI§)	
Use of UC¶ care protocol	N=245	N=305		
Yes	140 (57.1)	238 (78.0)	2.664 (1.839; 3.860)	<0.001
No	105 (42.9)	67 (22.0)		
Handwashing before UC care	N=266	N=261		
Yes	178 (66.9)	192 (73.6)	0.727 (0.450; 1.058)	0.100
No	88 (33.1)	69 (26.4)		
Hand disinfection before UC care	N=266	N=261		
Yes	228 (85.7)	241 (92.3)	0.498 (0.281; 0.881)	0.017
No	38 (14.3)	20 (7.7)		
Dry cord care	N=262	N=259		
Yes	36 (13.7)	12 (4.6)	0.305 (0.155; 0.601)	<0.001
No	226 (86.3)	247 (95.4)		
Solution for HU** care	N=208	N=196		
Normal saline solution	107 (51.4)	153 (78.1)	0.073 (0.038; 0.139)	<0.001
Ethanol solution	95 (45.7)	12 (6.1)		
Chlorhexidine solution	5 (2.4)	2 (1.0)		
Octenidine solution	1 (0.5)	29 (14.8)	35.946 (4.846; 266.647)	<0.001
Solution for RU†† care	N=204	N=193		
Normal saline solution	25 (12.0)	32 (16.5)	0.796 (0.459; 1.380)	0.811
Ethanol solution	165 (79.3)	48 (24.7)	0.274 (0.153; 0.492)	<0.001
Chlorhexidine solution	13 (6.3)	17 (8.8)		
Octenidine solution	1 (0.5)	96 (49.5)	200.816 (27.59; 1461.51)	<0.001
Solution for UU‡‡ care	N=199	N=191		
Normal saline solution	18 (8.7)	21 (10.9)	0.999 (0.530; 1.883)	0.998
Ethanol solution	163 (78.4)	54 (28.1)	0.056 (0.033; 0.094)	<0.001
Chlorhexidine solution	17 (8.2)	18 (9.4)	208.511 (28.64; 1518.01)	
Octenidine solution	1 (0.5)	98 (51.0)	208.511 (28.64; 1518.01)	<0.001

*Univariate logistic regression analysis; †Categorical variables presented as frequency (percentage); ‡Odds ratio; §Confidence interval; ‖P-value; ¶Umbilical cord; **Healthy umbilicus, ††Umbilicus at risk; ‡‡Unhealthy umbilicus.

Discussion

The objective of the study was to analyze the current UC care practice in Slovenia and to evaluate the impact of national UC care recommendations by comparing the UC care practice before and after their introduction in 2014. The results demonstrate that the implementation of recommendations has influenced and unified the UC care in newborns in Slovenia.

The national recommendations reach far more health care providers than local or institutional protocols. Moreover, the providers are more acceptable and compliant with their use if no recommendations existed before. If their work is diverse and individual, likewise in our outpatient care group, their adherence with the protocol might be even more consistent. On the other hand, the inpatient care group showed more inconsistency with the protocol, probably reflecting more established institutional practices. Putting all these reasons together might explain the 2.6 times higher odds for the current use of the national UC care protocol in Slovenia. Nevertheless, further efforts for increasing the influence of recommendations should be applied in the future, perhaps by drawing experience from bigger scale national recommendations (3).

Handwashing is a simple and effective method for preventing nosocomial infections (4). Though, the national protocol introduction had no important influence on the handwashing practice, as the proportion of respondents from both groups remained around 70%. This seems quite low for health care providers taking care of vulnerable newborns. But what did change during the observed period was the hand disinfection practice, as the proportion of respondents practicing hand disinfection before UC care increased significantly, reaching more than 99% compliance in the inpatient care group. The raising awareness on the importance of clean hands in the neonatal units remains the key for the prevention of nosocomial infection (5).

To improve the survival and well-being of newborns the World Health Organization indorses hygienic UC and skin care (6). The established term dry UC care denotes cleaning the UC with water and soap and drying it subsequently. In 2017 this practice was proposed as effective in promoting safe and fast UC healing (7). Nowadays safety arguments for adopting this practice are available (8). The Slovenian national UC care protocol, published in 2014, recommended dry UC care or the use of normal saline solution once daily for HU. Evidently, in the following years the UC care practice moved more towards the use of normal saline solution than dry UC care. The next revised version of the protocol should emphasize more on the importance, efficacy and safety of dry UC care.

As mentioned above, the protocol recommended the use of normal saline solution once daily for HU as an alternative to dry UC care. The main purpose of this recommendation was to abandon the use of disinfectants for HU care as they are unnecessary, potentially locally toxic, especially in preterm newborns, and as they prolong the UC separation time, yet without increasing the risk of infection, probably due to their antiseptic effect (9). The following effect was evident as the use of the normal saline solution for HU care increased by almost 30% and the use ethanol solution decreased by nearly 40%.

On the other hand, the protocol recommended the use of disinfectants for RU and UU care three times daily, promoting locally less toxic, yet still effective and long-lasting agents like chlorhexidine and octenidine solutions (10, 11). The results showed that these recommendations were well recognized as the use of ethanol solution decreased by half and the use of octenidine proportionately increased by half. Absent differences in RU and UU care between the inpatient and the outpatient group confirmed the unified coherence to the recommendations.

Conclusion

The implementation of national recommendations for UC care in 2014 significantly influenced the UC care in Slovenia. The current UC care practice in Slovenia is more unified and consistent with international recommendations. Furthermore, the adjusted UC care, depending on the clinical condition of the newborn's umbilicus, seems to put additional value to these recommendations, but further studies are needed to evaluate the efficacy of this practice. Further refinements of the UC care protocol should emphasize the importance, efficacy, and safety of the dry UC care.

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Conflict of Interest: The author declares that no conflicts of interest exist.

Data Statement: The data supporting the findings of this study are available from the corresponding author upon request.

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