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Auditing phototherapy-related nursing care in neonatal general and intensive care units

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ABSTRACT

Aims: Jaundice is among the most prevalent problems among neonates which can have toxic effects on the brain and cause serious complications. The commonest treatment for neonatal jaundice is phototherapy. Providing phototherapy by using clinical standards can enhance its effectiveness and safety, reduce its duration, shorten hospital stay, and minimize phototherapy-related complications. The aim of this study was 'to evaluate the accordance of phototherapy-related nursing care services with the current standards".

Methods: In this descriptive study, 120 phototherapy-related care delivery episodes were selected in 2013through time and event sampling and were observed and assessed by using a checklist. The checklist had been developed based on a literature review and the current standards. The validity of the checklist was established through content validity assessment and its reliability was confirmed by an inter-rater interclass correlation coefficient of 0.78. Study data were gathered through observing and documenting phototherapy-related care services provided in the neonatal care wards and neonatal intensive care units of four hospitals affiliated to Shahid Beheshti University of Medical Sciences, Tehran, Iran. The data were reported by using the measures of descriptive statistics which had been calculated by using the $SPSS_{21}$.

Results: The accordance of phototherapy-related nursing care services with the current standards in the study setting was moderate (58.7%).

Conclusions: Phototherapy-related care services are way below the standards. This can be related to factors such as care providers' inattentiveness, educational shortcomings, inadequate clinical supervision, limited equipment and facilities, and nurses' lack of knowledge about the importance and the outcomes of accurate phototherapy-related care services.

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1. Introduction

Neonates' experience different problems from which, hyperbilirubinemia or jaundice is very common, life-threatening, and challenging. Almost 60% of full-term and 80% of preterm neonates develop jaundice during the first week of their lives [1 and 2]. Jaundice is among the main causes of neonates' hospitalization [3]. About 75% of all neonates referring to hospital during the first postnatal week suffer from jaundice [4]. Although jaundice is usually benign in both full-term and preterm babies, severe hyperbilirubinemia is a medical emergency [5]. Untreated severe jaundice is highly neurotoxic and can cause kernicterus, mental retardation, and death [6]. Consequently, treating neonatal jaundice is of grave importance [7].

Since 1958, phototherapy was recognized as an effective non-invasive treatment for neonatal jaundice [1]. Phototherapy significantly reduces the need for exchange transfusion which causes different complications such as thrombocytopenia, hypoglycemia, hypocalcemia, hyponatremia, and blood-borne infections [8].

Although phototherapy seems to be a safe and effective treatment for jaundice, recent studies have shown that phototherapy can cause short-term complications such as mother-baby separation, loose stool, skin rash, imbalanced body temperature, fluid and electrolyte loss, shivering, bronze baby syndrome, as well as eye injury and nasal obstruction due to covering the eyes. Moreover, the long-term complications of phototherapy may include skin cancer, asthma, allergy, patent ductus arteriosus, and retinal damage [2].

Neonatal nurses are the first individuals who diagnose and manage potential health risks and life-threatening conditions [9]. Inappropriate nursing care for neonates receiving phototherapy may cause corneal ulcer, retinal damage, eye discharge, severe weight loss, thermoregulatory disorders, slight bilirubin decrease, greater length of phototherapy, and increased healthcare costs [10] while providing proper care to these neonates can minimize phototherapy-induced problems [2 and 11]. Rapid decrease of bilirubin in neonates suffering from hyperbilirubinemia prevents brain damage and reduces mother's stress, breastfeeding-related problems, extra expenses, and need for sophisticate treatment techniques [12].

The level of optimum phototherapy-related nursing care is determined by standards. In fact, the standards for clinical practice determine the efficiency of nursing care services. One of the common methods for quality assurance and improvement is auditing [13]. It is a highly precise mechanism for evaluating nursing care and reveals the strengths and the weaknesses of care services. Auditing is a quality improvement process which deals with systematically evaluating the quality of neonatal care based on clear standards [9].

Employing precise measures for neonatal care delivery, giving constructive feedback to nurses, and motivating them for developing and promoting good care plans enable neonatal nurses to improve the quality of their care services [13]. The aim of this study was to evaluate the accordance of phototherapy-related nursing care services with the current standards.

2. Methods

This descriptive study was conducted in 2013. The study setting was the neonatal care wards and neonatal intensive care units (NICU) of Mofid, Mahdieh, Imam Hossein (PBUH) and Shohaday-e Tajrish teaching hospitals, Tehran, Iran. These four hospitals were affiliated to Shahid Beheshti University of Medical Sciences, Tehran, Iran. Study population consisted of all phototherapy-related nursing care services provided in the study setting. The sample size was calculated based on the mean of monthly admissions in the study setting. Consequently, 120 care delivery episodes were selected through time and event sampling. In time sampling, observations are made in specific time-points in which the intended event happens regularly. Accordingly, we attended

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the study setting at the times when routine phototherapy-related care services were being provided and observed and documented the process of care delivery. On the other hand, event sampling is dependent on the knowledge of the observer about the circumstances and the situations in which the intended event happens. In other words, observations are made in certain circumstances or situations and hence, the observer needs to attend the situation to observe and document the intended event [14]. In this study, the events of interest were instances of admitting neonates to the study setting or starting physician-prescribed phototherapy for them.

A demographic questionnaire and a phototherapy checklist were used for data gathering. The items of the demographic questionnaire were related to neonates' age, gender, weight, gestational age, route of delivery, birth order, type of phototherapy, and pre-phototherapy serum level of bilirubin. The phototherapy checklist was used to evaluate the accordance of delivered phototherapy-related care services with the current standards. This checklist was developed based on the phototherapy care standards retrieved from nursing and medical textbooks and articles, clinical guidelines, and reliable online sources. It included 76 items on phototherapy-related care. The possible answers to each item were 'Performed correctly' (scored 2), 'Performed incorrectly' (scored 1), and 'Not performed' (scored 0). For face and content validity assessment, 20 nursing faculty members and neonatologists were asked to evaluate the clarity, simplicity, and relevance of the checklist items. The checklist was revised according to their recommendations. Moreover, the inter-rater agreement method was employed for evaluating the reliability of the checklist. Two observers (i.e. the first author and a nurse) who were identical in terms of background knowledge and competence completed the checklist for 20 neonates. The inter-rater interclass correlation coefficient was 0.78.

We avoided mentioning the names of the hospitals separately in the findings for the sake of research ethics. Moreover, hospital administrators were ensured that the information gathered from their hospitals would remain confidential. We started data collection primarily by obtaining necessary permissions from Shaid Beheshti University of Medical Sciences and Shahid Beheshti Faculty of Nursing and Midwifery, Tehran Iran, as well as the administrators of the hospitals. Then, we referred to the study setting each day in morning, evening, and night working shifts and performed structured observations of phototherapy-related nursing care services by using the study checklist.

The SPSS software version 21.0 was used for data analysis. Initially, the total score of each observation was calculated and then the scores were changed to percentage values, i.e. a 0–100 scale. Finally, 0–100 scores were divided into three levels of 0–33, 34–67, and 68–100 which were interpreted respectively as poor, moderate, and optimum accordance [15]. The study data were presented in a one-dimensional table by using the measures of descriptive statistics (such as frequency and percentage).

3. Results

As this study was conducted in neonatal care units, we also calculated information regarding the studied neonates' characteristics. The gestational age of 49.2% of the neonates and the postnatal age of 40% of them were respectively 37–39 weeks and 2–7 days. About 47.5% of them had a birth weight of 2000–2999 grams and 80% of them had a serum bilirubin level of 15–19.9 mg/dl.

In total, 9120 phototherapy-related care procedures were observed from which, 50.9% of the procedures were performed correctly, 15.4% were performed incorrectly, and 33.7% were not performed. The total score of the accordance of phototherapy-related nursing care with the standards was 58.7% with a range of 34–67, denoting a moderate level accordance (Table 1).

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Table 1: Frequency distribution of the accordance of phototherapy-related nursing care with the standards

Phototherapy-related nursing care	N	%
Performed correctly	4646	50.9
Performed incorrectly	1400	15.4
Not performed	3074	33.7
Sum	9120	100
Mean total score (%	58.7	
Interpretation	Moderate (34–67)	

4. Discussion

The findings of this study revealed that the accordance of phototherapy-related nursing care services with the current standards in the study setting was moderate and that most of the participants did not receive optimum care.

Phototherapy is an important treatment modality for managing moderate-to-severe neonatal jaundice. The amount of light delivered to a neonate during phototherapy needs to be measured. Such measurement can be done only at skin level and through a photometer [11]. However, study findings revealed that photometer device was not available in any of the units that were studied. Moreover, the amount of light emitted from phototherapy lamps was not measured before changing them. In other words, the lifetime of the lamps was not measured and they were changed only if they broke. Besides, most of the neonates received phototherapy while the phototherapy unit had not been covered with a white cover. The result of a study showed that covering the unit with a white plastic cover significantly enhanced the effectiveness of phototherapy in decreasing serum bilirubin level [16].

We also found that other neonates who were close to phototherapy units were not protected against light and hence suffered constantly from light exposure which could have endangered their health. Taheri et al. (2005) noted that cyclical lighting in NICUs can promote preterm neonates' growth and weight gain [13].

Another finding of the current study was nurses' inattention to the management of venipuncture pain while obtaining blood samples for bilirubin analysis. Parvizi et al. also found that most nurses who participated in their study did not know non-pharmacological pain management techniques. They reported lack of university-based and in-service education, time shortage, and physicians and nurses' resistance as the major barriers to pain management in neonatal care wards [18].

Although daily monitoring of weight and urine specific gravity is among the most important techniques for assessing dehydration in neonates receiving phototherapy, study findings indicated that the neonates' weight and urine specific gravity were not monitored in most cases. Yang et al. (2013) noted that dehydration-induced weight loss during the first three days of life is a significant factor behind hyperbilirubinemia. Neonates' dehydration and subsequent hyperbilirubinemia can be prevented through regular breastfeeding and supplemental bottle-feeding [19].

We also found that in most cases, neonates' parents were not educated about the potential short- and long-term complications of phototherapy, the manifestations of dehydration, and the negative outcomes of improperly performed phototherapy. This is in line with the findings reported by Mansoori Arani (2013). They found that parent education is provided moderately [20].

During phototherapy, body temperature may increase due to the heat produced by the lamps. Increased body temperature enhances blood flow and hence, causes intangible fluid loss. Moreover, there is a risk for hypothermia after discontinuing phototherapy [21]. Nonetheless, study findings showed that in most cases,

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neonates' body temperature was monitored neither after starting nor after discontinuing phototherapy. Najafipour (2011) also reported that the accordance of neonatal hypothermia-related care with the standards was at a moderate level [15].

The findings of this study also showed that the neonates' position was not regularly changed during phototherapy. Fakhraee et al. (2011) found that compared with neonates who were constantly in supine position the mean of serum bilirubin was lower in neonates whose position was changed regularly [22].

We also found that most nurses did not perform hand washing before starting phototherapy and touching the neonates. The results of a study on nurses' hand hygiene behavior illustrated that the percentage of circumstances in which nurses sanitized their hands was much below expectations probably due to nurses' limited access to hand disinfectants and their lack of knowledge about the importance of hand hygiene [23].

Many studies have been conducted so far on the auditing of neonatal nursing care. For instance, Najafi Anari (2012) made a study for auditing nutritional care provided to preterm neonates who were hospitalized in the NICUs of hospitals affiliated to Shahid Beheshti University of Medical Sciences. The result of their study also showed that the nutritional care provided to preterm neonates moderately accorded with the standards [24]. The findings of another study on auditing also indicated that the accordance of hypothermia-prevention nursing care with the standards was moderate [15]. Jaloo and Pazargadi (2009) also reported a moderate level of accordance between the standards and nutritional care services provided to neonates with neonatal distress syndrome in hospitals affiliated to Shahid Beheshti and Tehran Universities of Medical Sciences, Tehran, Iran. They concluded that there is a paramount need for in-service education and periodical evaluation [25]. The results of another study conducted to evaluate the quality of postnatal care (such as hand washing, maintaining a patent airway, determining the Apgar score, measuring weight, height, and head circumference, doing postnatal clinical examination, administrating vitamin K, providing breastfeeding education, and assessing neonates before discharge) also revealed that postnatal care services were of medium quality [26].

5. Conclusions

The findings of this study suggest that phototherapy-related care services are much below the standards. This can be related to factors such as care providers' inattentiveness, educational shortcomings, inadequate clinical supervision, limited equipment and facilities, and nurses' lack of knowledge about the importance and the outcomes of accurate phototherapy-related care services.

The present study dealt solely with the accordance of phototherapy-related care services with the standards. Consequently, further studies are needed for uncovering the reasons behind poor compliance with the standards. Developing and implementing phototherapy-related clinical guidelines and supervising their accurate implementation are among the first steps to the provision of quality and standard phototherapy-related care.

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