

## The Relationship between Nurse-To-Neonate Ratio, And Rationing of Nursing Care in Neonatal Intensive Care Units

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### Abstract

**Background:** Neonatal Intensive Care Units (NICU) had worse staff shortage in comparison to other hospital units. The number of neonates assigned to a nurse exceeds the ratio recommended by the professional organization that might result in rationing of important elements of care leading to adverse patient outcomes.

**Aim:** To examine the relationship between nurse-to-neonate ratio, and nursing care -rationing at acuity level III in NICUs

**Method:** A correlational, cross-sectional research design was conducted by using a structured questionnaire distributed among nurses that employed more than three months and who have a direct patient care for level III neonates were included. The sample size was 91 nurses and a total of 77 nurses completed the questionnaire.

**Results:** The common nurse to neonate ratio was 1:2. Less number of nurses had significant relationship with increase care rationing specifically the elements relating to implementation of treatment, neonate's monitoring, developmental care, and daily neonate care. While the frequently rationed elements were breastfeeding support, providing opportunities for kangaroo care, parental emotional support, and parents education.

**Conclusions/ implication for future practice:** the participated units exceeded the recommended nurse to neonate ratio and that associated with care rationing. Limit the nurse-to-neonate ratio in acuity level III to 1:1, and measure care rationing as a nursing quality indicator will improve the nursing practice.

**Key Words:** staffing - nursing care omission- nurse to patient ratio

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Date of Submission: 24-03-2019

Date of acceptance: 08-04-2019

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### I. Introduction

A Neonatal Intensive Care Unit (NICU) is one of the perinatal units that provide care for sick neonates (American Academy of Pediatrics, 2012). NICUs are mainly divided into three levels of care based on patient acuity level: level I; well newborn nursery, level II; special care nursery, level III; intensive care nursery. Level III NICUs are characterized by providing sustained life support for the most vulnerable patients due to very low birth weights (VLBW) and prematurity. Moreover, need complex and intensive nursing care that depends on individualized care (Rogowski et al., 2015).

The nurse-to-neonate ratio in a level III acuity as recommended by several nursing organizations is 1:1 (American Academy of Pediatrics, 2012; The British Association of Prenatal Medicine, 2010). Despite this, recent evidence shows that a large number of neonatal units are understaffed with respect to the recommended nurse-to-patient ratios (Rogowski *et al.*, 2013; Watson *et al.*, 2016).

However, in the Saudi Arabia context, the researcher found only one national study by (Mahfouz et al. 2010) reported the nurse to neonate ratio in NICU in Abha city was 1:5 but the limitation of these ratio is no specification about the level of care. Moreover, there is no standardized nurse to patient ratio by a professional Saudi nursing organization

Several studies concluded that shortage of staffing contributed to rationing or missing nursing care ( Ball, Murrells, Rafferty, Morrow, & Griffiths, 2013; Castner, 2012, Hernández-Cruz, R., Moreno-Monsiváis, M. G., Cheverría-Rivera, S., & Díaz-Oviedo, A., 2017). Rationing of care, which is newly recognized in nursing research (Piscotty & Kalisch, 2014), is defined as “withholding or failure to carry out certain aspects of care because of limited resources such as time, staffing or skill mix” (Schubert et al., 2008, p.228).

The most frequent rationed care elements were updating nursing care plans, emotional support, mobilization, oral hygiene and patient and family teaching (Ausserhofer et al., 2014; Ball, Murrells, Rafferty,

Morrow, & Griffiths, 2013; Papastavrou, E., Andreou, P., & Efstathiou, G. et al., 2013). In the Middle East, the frequently omitted nursing tasks in Lebanon and Turkey were similar, including ambulation & turning, emotional support and patient education (Kalisch, Doumit, Lee, & Zein, 2013; Kalisch, Terzioglu, & Duygulu, 2012). On the other hand, in the gulf region only 45% of medical-surgical nurses in Kuwait completed all the required tasks in their shift, While the most frequently missed tasks were comfort talks with patients and families, adequate documentation of nursing care and oral hygiene (Al-Kandari & Thomas, 2009). Under some circumstances nurses rationed one or more elements of nursing care that affect the quality of the care provided and lead to poor patient outcomes (Jangland E., Teodorsson T., Molander K., Muntlin Athlin A., 2017; Schubert et al., 2012)

Rocheffort & Clarke (2010) reported that adequate staffing & resources were related to lower rationing of neonatal nursing care. Moreover, essential nursing tasks were delayed or omitted when the British Association of Perinatal Medicine (BAMP) staffing standard was not met (Pillay, Nightingale, Owen, Kirby, & Spencer, 2012).

When the nurse is forced to omit a task because of workload or any other factor it tends to be the tasks which are perceived as having a lesser effect on patient well-being (Willis et al., 2012). The frequently rationed care in NICUs involved discharge planning, family support and teaching, and neonate comfort care (Rocheffort & Clarke, 2010). A study by Tubbs-Cooley et al. (2014) found that the most missed care in NICUs involved oral care for ventilated babies, educating and involving parents in care and oral feeding.

Based on the search in the database, it was hard to find relevant research either nationally or internationally about the relationship between rationing of neonatal nursing care and nurse to neonate ratio. The present study will investigate the relationship between nurse to neonate ratio and rationing of neonatal nursing care in neonatal intensive care units in Jeddah city.

### **Conceptual Framework:**

The conceptual framework by Schubert et al. (2007) "The Implicit Rationing of Nursing Care" was selected. The framework assumed that the process of care is associated with several variables: the nursing work environment, the philosophy of care, patient variables, and nurse variables. The rationing of nursing care occurred at a point within the process of care, particularly at the patient-to-nurse interface. Moreover, rationing of care depends on a nurse's decision-making and clinical judgment. It can be affected by the workload which is determined by two main factors: the patient care needs and the availability of nursing staff. Moreover, the rationing of care might affect patient outcomes and nurse's outcomes. (Schubert et al., 2012; Schubert, Glass, Clarke, & Schaffert-Witvliet, 2007).

This study investigated some variables within The Implicit Rationing of Nursing Care Framework including rationing of care, nurse-to-neonate ratio (workload), and nurses' variables. The workload was measured by the number of neonates assigned to a nurse. And Nurses' variables included educational level, experience, and continuous medical education. Thus, the relationship between the nurse-to-neonate ratio, and rationing of nursing care in level III Neonatal Intensive Care Units were examined.

### **Methods**

Descriptive correlational cross-sectional study design was conducted. This research used two NICUs, one at a government hospital and the other at a teaching hospital. Data was collected on December 2016 and stratified random sampling was applied. The sampling criteria included nurses who provide direct care for acuity level III. However, staffs with less than three months' clinical experience in the NICU were excluded. The total numbers of nurses working in NICUs were 159 and the sample size was 91 nurses. The investigator distributed the questionnaire to NICU nurses meeting the inclusion criteria in their work site. 91 questionnaires were distributed and 79 returned. The response rate was 83%.

### **Data Collection Tool**

A structured self-administered questionnaire designed by the investigator. It Comprised three parts:

- The first part demographic data
- The second part measured the nurse-to-neonate ratio. The participants were asked about the number of neonates assigned to them on the last worked shift.
- The Third Part Measured rationing of nursing care in the NICU by using the Rationing of Neonatal Nursing Care Scale (RNNCS). It was designed by the investigator based on the previous literature on rationing of nursing care (Jones, T., Hamilton, P. & Murry, N., 2015; Kalisch & Williams, 2009; Schubert et al., 2008).

The Rationing of Neonatal Nursing Care Scale consists of 41 neonatal nursing elements arranged under six categories including; daily neonate's care [seven elements], developmental care [seven elements], monitoring [ten elements], implementation of treatment [ten elements], support & education [3 elements], and

documentation & communication [four elements]. Participants were asked to indicate how often they could perform the listed tasks in the last three working shifts. The Rationing of Neonatal Nursing Care Scale (RNNCS) has four response options rarely done, sometimes done, often done, always done. The value of rationed care equated to the percentage summation of 'rarely done' and 'sometimes done'. Moreover, ranking the elements of care from most to least rationed was achieved by comparing the mean scores of the rationed elements.

## **II. Procedure**

Ethical approval (Reference No A00191, 204-14) was obtained from the research ethics committees at the two participating hospitals. Moreover the participation in this study involved no harm and only minimal risk, not more than the disruption of nurses' time for completing the research questionnaire. And the participants have the right to withdraw any time, anonymity was assumed. Accordingly, the completion of the questionnaire was considered as implied consent.

The content validity was ensured by five experts in neonatal nursing. Based on their evaluation, some modifications were made including changing the response alternatives of the Likert scale to four points (rarely able, sometimes able, often able and always able). The number of shifts in the declarative statement was changed to 3 instead of 7 because nurses in the participating hospitals usually worked from 3 to 5 consecutive shifts. This change makes their response more objective, and it avoids exhausting the subject's memory. Furthermore, a Developmental Care Category was added which consisted of seven elements concerning the integration of the developmental needs of the neonate within the context of nursing care. Moreover, a few elements were added and rephrased to make the scale suitable for measuring rationing of neonatal nursing care. The final number of scale elements became 41. The new modified tool was test by six nurses excluded from the original sample. No further modifications were required. The reliability of the Rationing of Neonatal Nursing Care Scale (RNNCS) was measured after a pilot study by testing its internal consistency using Cronbach's Alpha ( $R=0.96$ ).

### **Statistical Analysis**

#### **Data Cleaning**

Upon inspection of the 79 questionnaires, one case was dropped because of missed answers to the nurse-to-neonate ratio and rationing of neonatal nursing care questions and the sample became 78 nurses. Then data was cleaned by reviewing ten questionnaires randomly, and no errors found on SPSS data entry. The highest missing data was within the "prepared parents for a neonate discharge" element within the emotional support and parents' education category. It was missed by 7.6% of participating nurses.

#### **Data Analysis**

SPSS version 20 was used to perform data analysis at a 95% confidence interval ( $p < .05$ ). The descriptive analysis, including frequency and percentage, was applied to describe the demographics, the nurse-to-neonate ratio, and the rationing of neonatal nursing care.

Correlation testing was performed using the Pearson Correlation Coefficient test.

## **III. Result**

The present study revealed that two-thirds of the nurses had 7 to more than ten years of clinical experience in NICUs. In addition, more than 53.8% of the sample was BSN graduates while 44.9% had a diploma in nursing. Most of the participants (88.5%) had no special certification in neonatal intensive care while only 47.4% had Continuing Medical Education (CME) specializing in neonatal care in the last year.

The result indicated that nurses are usually caring for 1, 2 or 3 neonates in a level III NICU. Almost three-quarters of the nurses (70.6%) were assigned two neonates, a quarter of the participants (25.6%) cared for three neonates, and only (3.8%) provided care for one neonate.

The most rationed elements of care were within the developmental care category including support breastfeeding ( $M=2.61$ ) As 28.2% of the participants recorded 'sometimes done' and 19.2% scored 'rarely done', provide opportunities for kangaroo care ( $M=2.65$ ) was indicated by 28.2% as 'sometimes done', whilst 14.1% selected 'rarely done' and encourage parents participation in care ( $M=2.79$ ) was missed by the staff where 26.9% recorded 'sometimes done', and 12.8% indicated 'rarely done'.

In addition to two elements within emotional support and education category which were provide an emotional support to parents ( $M=2.71$ ) with 37.2% of the nurses scoring it as 'sometimes done', while 7.7% of them scored it as 'rarely done', and provide adequate education to parents ( $M=2.76$ ), with 35.9% of the participants selecting it as 'sometimes done', and 6.4% indicating 'rarely done'.

A negative correlation ( $r = -.357$ ) between the nurse ratio and rationing of nursing care found with a statistical significance of ( $P=.001$ ). More specifically there was a relationship between nurse to neonate ratio

and neonate's monitoring ( $P= .000$ ), implementation of treatment ( $P=.000$ ), Daily Neonate's Care ( $P= .013$ ) and developmental care ( $P= .023$ ). On the other hand, no statistical significance found between nurse to neonate ratio and emotional support & parent's education, documentation & communication.

#### **IV. Discussion**

##### **Rationing of Neonatal Nursing Care**

In this study, the rationing of neonatal nursing care was measured through six categories including Daily Neonate's Care, Developmental Care, Patient Monitoring, Implementation of Treatment, Support & Education, and Documentation & Communication.

As regards the Developmental Care Category, the frequently rationed elements were 'provide opportunities for kangaroo care', 'encourage parents' participation in care', and 'support breastfeeding'. Although kangaroo care is an important element in the developmental needs of a neonate, 14.1% of the nurses were rarely providing opportunities for kangaroo care and 28.2% selected 'sometimes done'. Only 44.7% of the nurses believe that nurses should be supportive of kangaroo care as reported by Hendricks-Muñoz, Louie, & Li, (2015). Correspondingly, a lower percentage (29%) of the nurses missed kangaroo care in the study of missed care in NICU (Tubbs-Cooley et al.,2014). It appears that nurses give low levels of attention to kangaroo care, which may be related to lack of knowledge or resources. Also the cultural barrier and lack of private space for performing kangaroo care could be one of the contributing factors.

Regarding rationing of encouraging parents' participation in care, 12.8% of nurses rarely did that element and 26.9% selected 'sometimes done'. A parallel percentage (39.1%) was found by Tubbs-Cooley et al. (2014). Encouraging parent participation in care shows a positive impact on supporting families' psychological wellbeing, bonding and attachment, shortening the length of stay, and reducing the number of readmissions as reported by Bastani, Abadi, &Haghani, (2015). There could be no immediate, measurable effect of parents' involvement in care such as a notable improvement in vital signs or the oxygenation level. However, parental participation enhanced the parent's skills in providing care for their baby and prepared them for home discharge.

Since the nurses are available all the time with the neonates, they have an active role in supporting breastfeeding. However, this role was rationed by the participating nurses with 19.2% indicating 'rarely done' and 28.2% 'sometimes done'. Hallowell, Spatz, Hanlon, Rogowski, & Lake (2014) found that only 14% of nurses reported providing breastfeeding support. Unfortunately, little evidence could be found in the literature about nurses supporting breastfeeding because the primary focus of the research in this field was the outcome of the breastfeeding, and less attention was given to the role of the nurses in encouraging and maintaining breastfeeding. Moreover, neither of the participating hospitals is known as a baby-friendly hospital. Therefore nurses might ration breast feeding support because it is not reinforced by policy or guidelines of the employing hospital.

Emotional Support & Parents Education category shows that the frequently rationed elements were 'provide emotional support to parents', and 'parents' education. In this study, 7.7% of the nurses scored the rationing of parental emotional support as 'rarely done' and 37.2% scored it as 'sometimes done'. In a similar setting, Rochefort & Clarke's (2010) found that only 20% of the nurses rationed parental emotional support. Parents' education was missed by 6.4% and 35.9% indicating 'rarely done' and 'sometimes done', respectively. Likewise, 41% of the nurses rationed family education in a study of nursing care left undone in 12 countries in Europe by Ausserhoferet al. (2014). Moreover around (20%) of the nurses missed family teachingas reported by Lake et al. (2017) and one-third of nurses working in different units reported missing patients and families' education (Carthon, Lasater, Sloane, Kutney-Lee, 2015).

Emotional support and parents' education are central elements of companionate nursing care. However, it is frequently rationed by the nurses. It seems that under the influence of a busy and chaotic work environment, less attention is given to the educational, emotional, and developmental care that are concerned with a neonate's and parents long-term outcomes. Furthermore, the language barrier might be a factor contributing to rationing of parent's education as some of the nurses non Arabic speakers.

The result reveals that nurses prioritized care that has a tangible and immediate effect on the neonate's health status as well as the care elements that improve the neonate's medical condition such as 'monitor vital signs', and 'administer medication'. Moreover, the nurses rationed the educational, emotional, and developmental care elements that are concerned with a neonate's long-term outcomes and psychological support for both the neonate and their parents.

##### **The Relationship between the Nurse-to-patient Ratio and the Rationing of Care:**

Sufficient number of nursing staff will lead to appropriate nurse to patient ratios that result in improve many aspects of the clinical practice environment, nursing care and patient safety (Sherenianet al.,2013).

In this study, 70.6% of the nurses were assigned to two neonates, 25.6% assigned to three neonates, and only 3.8 % assigned to one neonate .Most of the assignments for the participating nurses exceeded

the recommended minimum nurse-to-neonate ratio in acuity level III by the British Association of Prenatal Medicine, (2010) which is one patient to one nurse. The result of this study is in line with a local study (Alonazi& Omar, 2013) which found that nurses working in NICUs faced a greater workload compared with another pediatric unit because of staffing shortages and high levels of patient acuity.

As regards the relationship between nurse-to-neonate ratio and the rationing of neonatal nursing care a highly statistically significant negative correlation found. These findings were consistent with the literature of the rationing of care in adult care clinical settings (Al-Kandari& Thomas, 2009; Blackman *et al.*, 2014; Schubert, Ausserhoferet al., 2012). These researchers found that essential nursing care - such as patient monitoring, administering treatment, providing ADL, and developmental care was missed when the number of patients assigned to nurses increased.

Likewise, Tubbs-Cooley et al.(2014) reported that almost half of the study participants indicated that the shortage of nursing staff was a reason for missed care in NICU. Similarly, a more favorable work environment, especially increased nurse staffing and resources, was associated with less rationing of care in NICUs (Bragadóttir H., Kalisch B., Tryggvadóttir G., 2016, Rochefort & Clarke, 2010). From all the above, the findings revealed that the nurse-to-neonate ratio was most likely to be an important factor affecting the omission of nursing care due to increase the workload, which might, in turn, increase the incidence of adverse patient-outcomes.

For more specification, the Neonate Monitoring, Implementation of Treatment, and Daily Neonate's Care Categories showed highly statistically negative correlations with the nurse-to-neonate ratio. This is parallel with findings by Pillay et al.(2012) in a study about nurse staffing and delivery of care in a NICU. He indicated that essential nursing tasks such as vital signs, glucose monitoring, preparation and administration of feed, medication administration, neonatal body cleansing, and observing intravenous line sites were missed by 71% of NICU nurses when more than 1.2 neonates were assigned to a nurse. The result of this study explained that compliance with the recommended nurse to neonate ratio might be an effective intervention to reduce the serious omission of nursing care elements such as implementation of treatment, patient monitoring, and daily neonate's care.

Regarding the Support & Education Category was not statistically correlated with the nurse-to-neonate ratio. In comparison, Rochefort & Clarke (2010) reported that the rationing of infant comfort care and parental teaching, and support was 11% lower with better ratings for nursing staffing and resources. It is possible that other factors rather than the nurse-to-neonate ratio cause the rationing of these elements, for example, 'building a relationship with a family' which depends on sociocultural and language capability. Culture and language differences were considered as severe obstacles mostly with non-Arabic-speaking nurses. Similarly, Aldossaryet al. (2008) concluded that culture and language agreement are necessary to deliver effective nursing care.

Finally, an essential care element could be missed when the workload increased through assigning more patients to a nurse in NICU causing adverse outcomes.

### **Limitations**

The small sample size is a limitation arising from the small NICUs with their small bed capacity, which requires a small number of nurses and other staff .

## **Conclusion and Recommendations**

### **Conclusion**

This research aimed to study the relationship between nurse-to-neonate ratio and nursing care rationing in Neonatal Intensive Care Units level III of acuity. The common nurse to neonate ratio was 1:2 which exceeded the recommended ratio. This was associated with increase in the rationing of neonatal nursing care especially the implementation of treatment, neonate's monitoring, developmental care, and daily neonate care. The care elements frequently rationed by NICU nurses were breastfeeding support, providing opportunities for kangaroo care, providing parental emotional support and education, encouraging parental participation in a neonate's care, and providing appropriate pain relief measures.

### **Implications for Nursing Management**

The present study recommends the following:

- Measure rationing of care as a nursing quality indicator to detect gaps in nursing care and reduce the risk of rationed nursing care.
- Initiate Baby Friendly Hospital program to improve the quality of care and neonate's outcomes
- Developing and implementing a staffing policy that identifies the minimum nurse-to-neonate ratio (1:1) in NICU III of acuity.
- Establishing a specialized neonatal nursing care program.

- Establishing orientation and educational programs for nurses that support family-centered care and developmental care.
- Future research about other factors related to the practice environment and nursing staff characteristics which affect the rationing of neonatal nursing
- A larger sample size by including more settings is recommended.

### Acknowledgments

Thanks go first to God Almighty. I would like to express a sense of appreciation, and love to my parents Abdulaziz Uthman and SafaaJastnia for their praying and supporting me throughout my life, and to my husband Alaa Rambo for his consistent encouragement and motivation. Moreover, I would like to recognize my children, Abdulrahman, Taha, and Joud.

My deepest gratitude to my thesis advisor Dr. HasnahBanjer and co-advisor Dr. Wafaa Ali who were significant persons in my professional growth. They were very respectful, and tremendous dissertation advisors beyond the education experience.

I would moreover like to thank the experts who were involved in the validation survey for this research.

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Ms. Ethar Abdulaziz Uthman. "The Relationship between Nurse-To-Neonate Ratio, And Rationing Of Nursing Care in Neonatal Intensive Care Units." *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*, vol. 8, no.02 , 2019, pp. 82-88.