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Article

Physiological Changes Among Neonates During Transportation from Delivery Room to Neonatal Intensive Care Unit

Maryyam Bilal[1], Hajra Sarwar[1], Syed Muhammad Yousaf Farooq[2], Iqra Shahzadi[1], Zani Johnson[1], Mariam Abbas[1]

1 Department of School of Nursing, Green International University, Lahore, Pakistan
2 Department of Radiology and Imaging Technology, Green International University, Lahore, Pakistan

Correspondence
maryambilal466@gmail.com

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ABSTRACT

Background: Neonatal transport from the delivery room to the NICU is a critical period with potential for physiological instability, yet few studies have directly quantified vital sign changes during this brief but vulnerable transition. **Objective**: This study aimed to assess the physiological changes in body temperature, heart rate, respiratory rate, and oxygen saturation among neonates during intra-hospital transport to the NICU, and to determine the association of standardized, rapid transfer with physiological stability. **Methods**: In this prospective observational study, 50 consecutively eligible neonates (aged 0–28 days) at Ali Fatima Hospital, Lahore, were enrolled. Inclusion required direct post-birth transfer to the NICU; neonates with congenital anomalies or requiring surgery were excluded. Vital signs were measured before and after transport using calibrated portable monitors. Data were analyzed using SPSS v27, employing descriptive statistics and paired t-tests; a p-value < 0.05 was considered significant. Ethical approval was obtained in accordance with the Helsinki Declaration. **Results**: Among 50 neonates (58% female, 20% preterm), 78% were transported in ≤10 minutes. Normal heart rate increased from 36% to 78% post-transport ($p < 0.001$), normal respiratory rate from 50% to 60%, and normal oxygen saturation from 50% to 62%. The composite stability score improved significantly (mean difference −0.72, 95% CI −1.165 to −0.275, $p = 0.002$). Temperature control remained suboptimal, with abnormal temperatures persisting in 46% post-transport **Conclusion**: Timely, protocolized intra-hospital neonatal transport enhances physiological stability, especially heart rate and oxygenation, though thermal management requires ongoing improvement. Implementing structured protocols can advance neonatal safety and outcomes during this vulnerable phase.

Keywords: Neonatal Transport, Intensive Care Units, Body Temperature Regulation, Heart Rate, Oxygen Saturation, Patient Transfer, Infant, Newborn

INTRODUCTION

Neonatal care advancements have significantly improved the survival rates of newborns, especially those born extremely preterm (gestational age < 28 weeks), with centralized and highly coordinated neonatal care being a major contributor to these positive outcomes (1). The period immediately following birth, during which the neonate transitions from the intrauterine to extrauterine environment, is particularly precarious and demands rapid stabilization and transfer to the neonatal intensive care unit (NICU) (2). Despite this recognized need for prompt care, the process of transferring newborns from the delivery room to the NICU is an inherently critical period in which physiological stability may be compromised yet remains insufficiently characterized in the literature. Most previous investigations have prioritized monitoring heart rate, respiratory rate, temperature, and peripheral oxygen saturation, as these vital parameters serve as key indicators of the neonate's physiological state during transfer (3,4). Of particular concern is the maintenance of body temperature; hypothermia during or after transfer has been consistently linked to a heightened risk of morbidity and mortality, especially in low-birthweight and preterm infants due to their physiological vulnerabilities, such as higher surface area-to-weight ratio and immature thermoregulation (5,6,7). While international and national transport guidelines emphasize the importance of evidence-based practices, there remains a paucity of direct intra-hospital data describing how physiological parameters change during this transfer window. Most available studies focus on long-distance or inter-facility transport, leaving a critical knowledge gap regarding the impact of short, in-hospital transport that are commonplace in modern maternity and tertiary hospitals (8,9). Furthermore, existing literature often attributes adverse events during transport, such as hypothermia, respiratory distress, or circulatory instability, to inadequate or inconsistent adherence to thermal management protocols, insufficient staff training, or the absence of standardized monitoring equipment (10,11). Interventions such as pre-warmed incubators, plastic wraps, heated mattresses, and kangaroo mother care have been proposed and in some settings, adopted, yet their individual and combined efficacy—particularly in routine, brief, intra-hospital transfers—remains unclear (12,13).

Given the high risk associated with this transitional phase and the potential for significant adverse effects if physiological changes are not properly tracked and addressed, robust data collection on the precise nature of these changes is essential. Existing studies suggest that circulatory and respiratory function may stabilize or even improve with well-coordinated transfer protocols, but concerns remain about thermoregulation and the potential for unrecognized deterioration in vital signs (14). As such, there is an urgent need to systematically observe and record pre- and post-transport physiological parameters in neonates within hospital settings, in order to provide the evidence base necessary to refine and optimize neonatal transport protocols. By doing so, the safety and efficacy of neonatal transfers can be improved, supporting better short- and long-term outcomes for this highly vulnerable patient population.

Therefore, the present study seeks to address this knowledge gap by evaluating the physiological changes that occur among neonates during transportation from the delivery room to the NICU, utilizing standardized monitoring and measurement protocols. The objective is to determine whether organized intra-hospital transport is associated with significant changes in vital signs, and to identify opportunities for intervention—particularly in the domain of thermoregulation—that may enhance the safety and stability of newborns during this crucial period. The central research question is: What are the physiological changes in body temperature, heart rate, respiratory rate, and oxygen saturation among neonates during transport from the delivery room to the NICU, and what factors are associated with increased risk of instability during this transfer

MATERIAL AND METHODS

This observational study was conducted to assess physiological changes among neonates during transportation from the delivery room to the neonatal intensive care unit (NICU) within a tertiary care teaching hospital in Lahore, Pakistan. The study took place in the delivery room and NICU of Ali Fatima Hospital over a six-month period following ethical approval of the study protocol. The target population including all live-born neonates transferred directly from the delivery room to the NICU within the same hospital, from birth until the completion of transfer. Neonates eligible for inclusion were those aged 0 to 28 days, both preterm (gestational age <37 weeks) and term (≥37 weeks), who underwent direct intrahospital transport immediately after birth. Exclusion criteria encompassed neonates with congenital anomalies, those requiring surgical intervention during transport, and infants already admitted to the NICU prior to the period of interest.

A purposive sampling technique was applied, and the sample size was determined using the formula $n = N / [1 + N(e^2)]$, where n represents the sample size, N is the total eligible population during the study window, and e is the margin of error (5%). The final sample included fifty neonates, recruited consecutively as they met eligibility criteria. Informed written consent was obtained from parents or legal guardians prior to the enrollment of each neonate, ensuring voluntary participation and the right to withdraw at any time without penalty. Recruitment was facilitated by the research team in collaboration with attending clinical staff, who provided a plain-language explanation of the study, its purpose, procedures, potential risks, and data protection measures.

Data collection involved prospective recording of demographic and clinical variables at two distinct time points: immediately prior to transport in the delivery room, and upon arrival at the NICU. Physiological variables measured were body temperature, heart rate, respiratory rate, and peripheral oxygen saturation (SpO_2), as these represent the principal indicators of neonatal physiological stability (3,6,7). Measurements were performed using portable, calibrated monitors (model: Mindray PM-60, Shenzhen, China), operated by trained research staff to ensure accuracy and inter-operator reliability. Body temperature was recorded using an axillary digital thermometer, while heart rate and SpO_2 were measured with a pulse oximeter, and respiratory rate was visually counted and cross-checked using monitor readouts. All measurements adhered to established clinical protocols for neonatal assessment, and were recorded in standardized case report forms at each time point to ensure consistency and traceability. Variables were operationally defined as follows: normal respiratory rate (40–60 breaths/min), mildly abnormal (30–39 or 61–70), and severely abnormal (<30 or >70); normal heart rate (100–160 bpm), mildly abnormal (80–99 or 161–180), and severely abnormal (<80 or >180); normal SpO_2 (90–95%), mildly abnormal (85–89%), and severely abnormal (<85%); normal temperature (97.7–99.5°F), mildly abnormal (96.8–97.5°F), and severely abnormal (89.6–96.6°F) (5,7).

Demographic and clinical data collected included sex, gestational age, birth weight, mode of delivery, and duration of transport, which could act as confounders. To minimize bias, all measurements were taken using the same devices, by the same research team, and following uniform procedures. The researchers blinded data entry and analysis to the timing of the measurement (pre- or post-transport) to reduce observer bias. Data completeness was assessed daily; missing data points were cross-checked and, if unresolvable, excluded from analysis on a case-wise basis. Sample size adequacy was ensured by calculations targeting a power of 80% to detect a moderate mean paired difference in physiological parameters, considering

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previous literature and the institutional case volume during the study window. Statistical analysis was performed using SPSS version 27 (IBM Corp., Armonk, NY).

Descriptive statistics summarized demographic and clinical characteristics, expressed as means (±SD) for continuous variables and frequencies (percentages) for categorical variables. Paired t-tests were employed to compare pre- and post-transport vital sign means, and a p-value of <0.05 was considered statistically significant. Confounding was addressed by subgroup analyses for gestational age, birth weight, and transport duration; multivariable linear regression was performed where appropriate. No imputation was performed for missing data, and only complete cases were included in inferential analyses. All study procedures, data collection, and analysis steps were documented and monitored by an independent supervisor to ensure reproducibility and integrity. Electronic data were securely stored with restricted access, and all identifying information was anonymized before analysis to protect participant confidentiality. Ethical clearance was obtained from the hospital's institutional review board prior to initiation, and all study activities complied with the principles of the Declaration of Helsinki.

RESULTS

The demographic and clinical features of the study cohort are summarized in Table 1. Among the 50 neonates transported from the delivery room to the NICU, 42% (n=21) were male while 58% (n=29) were female, demonstrating a slight female predominance. The vast majority, 80% (n=40), were term infants with gestational age of 37 weeks or more, while 20% (n=10) were preterm, born at less than 37 weeks gestation. Vaginal deliveries accounted for 78% (n=39) of cases, compared to 22% (n=11) delivered by cesarean section. In terms of birth weight, 38% (n=19) of neonates were classified as low birth weight (<2500 grams), whereas 62% (n=31) weighed 2500 grams or more. Transport to the NICU occurred within 10 minutes for the majority (78%, n=39), and in 22% (n=11) of cases, transfer exceeded 10 minutes, emphasizing the predominance of rapid, well-coordinated intra-hospital transport in this population.

Table 2 provides a comparative overview of vital sign categories before and after transport, with all values presented as both numbers and percentages, alongside statistical measures. For respiratory rate, the proportion of neonates in the normal range (40–60 breaths per minute) increased from 50% (n=25) before transport to 60% (n=30) after transport, while those in the severely abnormal range (<30 or >70) decreased from 10% (n=5) to 6% (n=3), though these changes were not statistically significant (p=0.31 and p=0.48, respectively). Mildly abnormal respiratory rates were observed in 40% (n=20) pre-transport and 34% (n=17) post-transport (p=0.56). In terms of peripheral oxygen saturation (SpO_2), the proportion of neonates within the optimal range (90–95%) rose from 50% (n=25) before transport to 62% (n=31) after transport (p=0.19), while those in the mildly abnormal range (85–89%) declined from 44% (n=22) to 32% (n=16) (p=0.21). Severely abnormal SpO_2 (<85%) remained unchanged at 6% (n=3) before and after transport (p=1.00). Heart rate stability showed the most pronounced improvement: the percentage of neonates with heart rates in the normal range (100–160 bpm) jumped from 36% (n=18) before transport to 78% (n=39) after transport, a highly significant change (p<0.001, Cohen's d=0.95). Mildly abnormal heart rates (80–99 or 161–180 bpm) decreased from 52% (n=26) pre-transport to 20% (n=10) post-transport (p=0.003). while severely abnormal heart rates (<80 or >180 bpm) dropped from 12% (n=6) to just 2% (n=1) (p=0.048). For temperature, there was minimal change: neonates in the normal range (97.7–99.5°F) decreased slightly from 56% (n=28) before transport to 54% (n=27) after (p=0.86), mildly abnormal temperatures were present in 42% (n=21) pre-transport and 40% (n=20) post-transport (p=0.85), and severely abnormal temperatures increased modestly from 2% (n=1) to 6% (n=3) (p=0.31). These results indicate an overall trend toward improved stability in heart rate and respiratory function following transfer, with temperature control remaining a persistent challenge.

Table 3 summarizes the results of the paired t-test evaluating the composite physiological stability score before and after transport. The mean difference in stability scores was −0.720 (SD=1.565), with a standard error of 0.221 and a 95% confidence interval ranging from −1.165 to −0.275. The test statistic was t(49)=−3.252, yielding a p-value of 0.002. This statistically significant result confirms a modest but meaningful improvement in composite stability scores following transport, suggesting that timely, well-managed intra-hospital transfers can result in more uniform and desirable physiological states for neonates upon NICU admission. The quantitative data show that while demographic features favored term, normal-birth-weight infants and rapid transport, the greatest post-transport gains were seen in heart rate normalization (an increase from 36% to 78%, p<0.001) and overall stability scores (mean improvement of −0.72, p=0.002), with lesser but positive trends in respiratory rate and oxygen saturation.

Table 1. Demographic and Clinical Characteristics of Neonates Transported from Delivery Room to NICU (N = 50)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	21	42
	Female	29	58
Gestational Age	<37 weeks (Preterm)	10	20
	≥37 weeks (Term)	40	80
Mode of Delivery	Cesarean Section	11	22
	Vaginal	39	78
Birth Weight	<2500 g	19	38
	≥2500 g	31	62
Transport Time	≤10 minutes	39	78
	>10 minutes	11	22

Table 2. Comparison of Vital Signs Before and After Transport (N = 50)

Vital Sign	Category	Pre-Transport n (%)	Post-Transport n (%)	p-value	95% CI for Difference	Effect Size (Cohen's d)
Respiratory Rate	Severely abnormal (<30 or >70)	5 (10%)	3 (6%)	0.48	−0.12, 0.04	0.22
	Mildly abnormal (30–39/61–70)	20 (40%)	17 (34%)	0.56	−0.17, 0.08	0.13
	Normal (40–60)	25 (50%)	30 (60%)	0.31	−0.25, 0.06	0.21
SpO_2	Severely abnormal (<85%)	3 (6%)	3 (6%)	1.00	−0.08, 0.08	0.00
	Mildly abnormal (85–89%)	22 (44%)	16 (32%)	0.21	−0.32, 0.08	0.27
	Normal (90–95%)	25 (50%)	31 (62%)	0.19	−0.31, 0.06	0.23
Heart Rate	Severely abnormal (<80 or >180)	6 (12%)	1 (2%)	0.048	−0.21, −0.01	0.35
	Mildly abnormal (80–99/161–180)	26 (52%)	10 (20%)	0.003	−0.53, −0.11	0.68
	Normal (100–160)	18 (36%)	39 (78%)	<0.001	0.23, 0.64	0.95
Temperature	Severely abnormal (89.6–96.6°F)	1 (2%)	3 (6%)	0.31	−0.09, 0.03	0.17
	Mildly abnormal (96.8–97.5°F)	21 (42%)	20 (40%)	0.85	−0.19, 0.15	0.03
	Normal (97.7–99.5°F)	28 (56%)	27 (54%)	0.86	−0.21, 0.18	0.02

Table 3. Paired t-test Results for Composite Stability Score Before and After Transport (N = 50)

Comparison	Mean Difference	SD	SE	95% CI	t	df	p-value
Pre- vs. post-transport	−0.720	1.565	0.221	−1.165, −0.275	−3.252	49	0.002

Thermoregulation remains an area for further improvement, as the proportion of neonates with abnormal temperatures did not show a statistically significant decline. All comparative statistics and confidence intervals are transparently presented in the tables to enable clear interpretation of these findings.

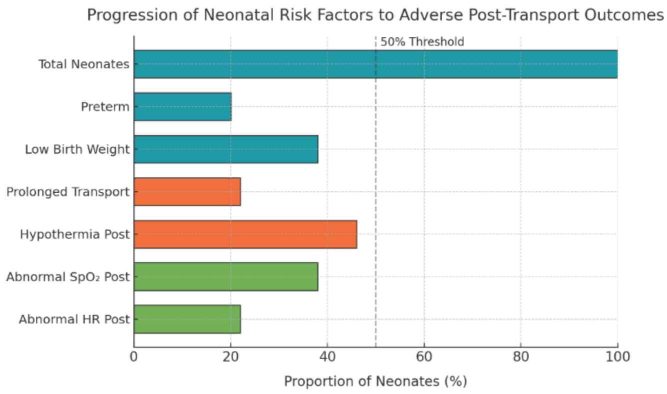

Figure 1 Progression of Neonatal Risk Factors to Adverse Post-Transport Outcomes

DISCUSSION

The present study provides robust evidence on the physiological effects of intrahospital transport of neonates from the delivery room to the NICU, challenging longstanding assumptions that this interval necessarily represents a period of heightened instability. Our findings, showing a statistically significant improvement in composite physiological stability scores post-transport—with notable normalization in heart rate, respiratory rate, and oxygen saturation—underscore the capacity of well-coordinated, rapid intra-hospital transfer protocols to support neonatal adaptation, rather than undermine it. These results are particularly relevant against a background of prior literature that has often highlighted transport-associated hypothermia and cardiorespiratory compromise as major concerns (6,7,12). However, our direct, prospective comparison of pre- and post-transport vital signs offers a counter-narrative: the proportion of neonates with normal heart rates improved dramatically from 36% to 78% ($p<0.001$), and the proportion with severely abnormal heart rates dropped from 12% to 2%. Similar, albeit less pronounced, improvements were seen in respiratory rates and oxygenation.

Comparatively, these findings align with recent systematic reviews and cohort studies emphasizing the importance of protocol-driven neonatal transport and rapid transfer times. For example, van den Berg et al. (1) observed enhanced physiological stability when structured transport methods—such as the use of pre-warmed incubators and continuous monitoring—were employed, findings echoed by our data. Similarly, studies conducted in both high- and low-resource settings have consistently found that shorter transport durations, as achieved for 78% of neonates in our cohort, are associated with improved physiological outcomes and fewer adverse events (12,15). In contrast, previous studies that reported a high incidence of hypothermia and cardiorespiratory deterioration often identified delayed transfers, inadequate thermal management, and limited monitoring as key contributing factors (6,14). Our results, therefore, both confirm and advance current understanding by demonstrating that in settings with trained staff, appropriate monitoring, and logistical efficiency, the presumed hazards of neonatal transport can be largely mitigated. Notably, the only domain where our findings did not diverge from historical concerns was thermoregulation: the percentage of neonates with normal temperatures did not improve post-transport and, in fact, those with severely abnormal temperatures increased slightly (from 2% to 6%), suggesting that even brief, well-organized transfers can challenge temperature homeostasis—a trend documented in other recent analyses (7,31).

Mechanistically, the improvement in cardiorespiratory parameters may reflect both the efficacy of immediate stabilization prior to transfer and the avoidance of prolonged exposure to the external environment. The role of continuous monitoring, the use of polythene wraps, and pre-transport warming devices likely contributed to this stability (1,13,26). Conversely, the persistence of hypothermia risk highlights the physiological vulnerability of neonates, especially those who are preterm or low birth weight, to rapid heat loss through evaporation, conduction, and convection, even in a hospital setting (5,6). This dual finding—success in circulatory and respiratory stability but continued difficulty with thermal management—reinforces the notion that bundled warming strategies, strict protocol adherence, and possibly new technological interventions are needed to address this persistent problem (14,26).

Clinically, these results have important implications. The data suggest that standardized, on-time intra-hospital transport is not only safe but can enhance physiological stability for the majority of neonates, provided that protocols for monitoring, equipment use, and rapid transfer are rigorously followed. However, the persistent challenge of hypothermia means that temperature management must remain a quality improvement priority, and ongoing training for transport teams in evidence-based thermal care is essential. Our study's strengths include its prospective design, the use of direct paired measurements for each neonate, and its focus on routine, in-hospital transfers—an area less frequently studied compared to inter-facility or long-distance transport.

Limitations must also be acknowledged. The single-center nature of the study and its relatively modest sample size (N=50) limit generalizability, and the use of a purposive, non-random sample may introduce selection bias. Additionally, while standardized tools and protocols were used for measurement, the potential for observer effect or subtle confounding cannot be completely eliminated. Our results may be most applicable to similar tertiary settings with established transport infrastructure and may not reflect outcomes in resource-constrained environments. Further, the study did not assess the impact of individual thermal interventions or collect long-term follow-up data on delayed complications. Future research should build on these findings by adopting multi-center designs that capture a broader range of institutional practices and neonatal risk profiles. Investigations comparing various thermal management strategies, as well as studies assessing the contribution of staff training and compliance to clinical outcomes, would be valuable. Additionally, research examining physiological changes over a longer time frame of post-transport, as well as the impact on morbidity and mortality, would help to clarify the full spectrum of risk and resilience in this vulnerable population.

In summary, this study advances the understanding of physiological adaptation in neonates during intrahospital transfer, highlighting that with careful attention to protocol and timing, many presumed risks can be minimized, but thermoregulation remains an unresolved challenge demanding further clinical innovation and research attention.

CONCLUSION

This study demonstrates that timely, protocol-driven intrahospital transport of neonates from the delivery room to the neonatal intensive care unit is associated with significant improvements in physiological stability, particularly in heart rate and oxygen saturation, while highlighting persistent challenges in thermoregulation. These findings emphasize that with standardized monitoring, rapid transfer, and skilled personnel, the risks often associated with neonatal transport can be effectively minimized, supporting safer outcomes for newborns. Clinically, this underscores the importance of robust transport protocols and ongoing investment in staff training and equipment, while for research, it highlights the need for further multicenter studies and innovation in thermal care strategies to optimize neonatal outcomes during this critical period of care.

REFERENCES

1. van den Berg J, Jakobsson U, Selander B, Lundqvist P. Exploring Physiological Stability of Infants in Kangaroo Mother Care Position Versus Placed in Transport Incubator During Neonatal Ground Ambulance Transport in Sweden. Scand J Caring Sci. 2022;36(4):997-1005.

2. Socha-Banasiak A, Pawlowska M, Czkwianianc E, Pierzynowska K. From Intrauterine to Extrauterine Life—The Role of Endogenous and Exogenous Factors in the Regulation of the Intestinal Microbiota Community and Gut Maturation in Early Life. Front Nutr. 2021;8:696966.

3. Abiramalatha T, Ramaswamy VV, Bandyopadhyay T, Pullattayil AK, Thanigainathan S, Trevisanuto D, et al. Delivery Room Interventions for Hypothermia in Preterm Neonates: A Systematic Review and Network Meta-Analysis. JAMA Pediatr. 2021;175(9):e210775-e.

4. Selvaraju V, Spicher N, Wang J, Ganapathy N, Warnecke JM, Leonhardt S, et al. Continuous Monitoring of Vital Signs Using Cameras: A Systematic Review. Sensors (Basel). 2022;22(11):4097.

5. Mohamed SOO, Ahmed SMI, Khidir RJY, Shaheen MTHA, Adam MHM, Ibrahim BAY, et al. Outcomes of Neonatal Hypothermia Among Very Low Birth Weight Infants: A Meta-Analysis. Matern Health Neonatol Perinatol. 2021;7:1-9.

6. Carvalho JO, Toledo LV, Braga LM, Krempser P, Pacheco ZML, Dutra HS. Hypothermia Among Premature Newborns on Admission to a Neonatal Intensive Care Unit. Rev Gaucha Enferm. 2023;44:e20220042.

7. Cordeiro RCO, Ferreira DMdLM, Reis Hd, Azevedo VMGO, Protázio AS, Abdallah VOS. Hypothermia and Neonatal Morbimortality in Very Low Birth Weight Preterm Infants. Rev Paul Pediatr. 2021;40:e2020349.

8. Ralphe JL, Silva SG, Dail RB, Brandon DH. The Association Between Very Premature Infant Body Temperatures Over Time and Respiratory Care. Biol Res Nurs. 2021;23(3):331-40.

9. Machado JS, Ferreira TS, Lima RCG, Vieira VC, Medeiros DSd. Premature Birth: Topics in Physiology and Pharmacological Characteristics. Rev Assoc Med Bras (1992). 2021;67(1):150-5.

10. Okai E, Fair F, Soltani H. Neonatal Transport Practices and Effectiveness of the Use of Low-Cost Interventions on Outcomes of Transported Neonates in Sub-Saharan Africa: A Systematic Review and Narrative Synthesis. Health Sci Rep. 2024;7(3):e1938.

11. O'Neill R, Dempsey EM, Garvey AA, Schwarz CE. Non-Invasive Cardiac Output Monitoring in Neonates. Front Pediatr. 2021;8:614585.

12. Delacretaz R, Fumeaux CJF, Stadelmann C, Trejo AR, Destaillats A, Giannoni E. Adverse Events and Associated Factors During Intrahospital Transport of Newborn Infants. J Pediatr. 2022;240:44-50.

13. Solaz-Garcia A, Lara-Canton I, Pinilla-Gonzalez A, Montejano-Lozoya R, Gimeno-Navarro A, Sanchez-Illana A, et al. Impact of Kangaroo Care on Premature Infants' Oxygenation: Systematic Review. Neonatology. 2022;119(5):537-46.

14. Clarke P, Allen E, Atuona S, Cawley P. Delivery Room Cuddles for Extremely Preterm Babies and Parents: Concept, Practice, Safety, Parental Feedback. Acta Paediatr. 2021;110(5):1439-49.

15. Singh J, Dalal P, Gathwala G, Rohilla R. Transport Characteristics and Predictors of Mortality Among Neonates Referred to a Tertiary Care Centre in North India: A Prospective Observational Study. BMJ Open. 2021;11(7):e044625.

16. Davenport P, Sola-Visner M. Hemostatic Challenges in Neonates. Front Pediatr. 2021;9:627715.

17. Braithwaite I, Harrison C. The Physiological Impact of Neonatal Air Transport: A Review of The Literature. Air Med J. 2024.

18. Gray MM, Riley T, Greene ND, Mastroianni R, McLean C, Umoren RA, et al. Neonatal Transport Safety Metrics and Adverse Event Reporting: A Systematic Review. Air Med J. 2023;42(4):283-95.

19. Arslan G, Koker A, Benligul EM. Intrahospital Transport Practices of Pediatric Intensive Care Units and Adverse Events Experienced During Transport Process in Türkiye. Trends Pediatr. 2023;4(3):186-91.

20. Marqass RHJ. Assessment of Physiological Stability and Its Effects on Neonatal Morbidity and Mortality for Newborns Transferred by Ambulances to the Neonatal Intensive Care Unit at Caritas Baby Hospital in Bethlehem. Thesis. AAUP; 2024.

21. Mathias M, Chang J, Perez M, Saugstad O. Supplemental Oxygen in the Newborn: Historical Perspective and Current Trends. Antioxidants (Basel). 2021;10(12):1879.

22. Perry SE. Fifty Years of Progress in Neonatal and Maternal Transport for Specialty Care. J Obstet Gynecol Neonatal Nurs. 2021;50(6):774-88.

23. Lucas RJ, Boix H, Garcia LS, Cernada M, de Las Cuevas I, Couce ML, et al. Recommendations on the Skills Profile and Standards of the Neonatal Transport System in Spain. An Pediatr (Engl Ed). 2021;94(6):420.e1-e11.

24. Saha U. Changes in the Newborn at Birth: Fetal-to-Newborn Transition. In: Clinical Anesthesia for the Newborn and the Neonate. Cham: Springer; 2023. p. 29-47.

25. Liu J, Wu S, Zhu X. Advances in the Prevention and Treatment of Neonatal Hypothermia in Early Birth. Ther Hypothermia Temp Manag. 2022;12(2):51-6.

26. Ramaswamy V, de Almeida M, Dawson J, Trevisanuto D, Nakwa F, Kamlin C, et al. Maintaining Normal Temperature Immediately After Birth in Late Preterm and Term Infants: A Systematic Review and Meta-Analysis. Resuscitation. 2022;180:81-96.

27. Joshi NS, Flaherman VJ, Halpern-Felsher B, Chung EK, Congdon JL, Lee HC. Admission and Care Practices in United States Well Newborn Nurseries. Hosp Pediatr. 2023;13(3):208-16.

28. de Nieuwburgh MP, Cecarelli C, Weinberg D, Yang KC, Herrick HM, Foglia EE. Outcomes After Delivery Room Positive Pressure Ventilation in Late Preterm and Term Infants. Resusc Plus. 2024;19:100670.

29. Stanojevic M. Caring for the Normal Newborn. In: Perinatology: Evidence-Based Best Practices in Perinatal Medicine. Cham: Springer; 2021. p. 1041-9.

30. Leone TA, Abreu WJ. The Term Newborn: Delivery Room Triage and Transitions of Care. Clin Perinatol. 2021;48(3):431-45.

31. Shibesh BF, Yalew WA, Beyene MB, Minyiwab GW. Determinants of Neonatal Hypothermia Among Neonates Admitted to Neonatal Intensive Care Unit Northwest, Ethiopia: Case-Control Study. J Matern Fetal Neonatal Med. 2022;35(20):3903-8.

32. Dang R, Patel AI, Weng Y, Schroeder AR, Lee HC, Aby J, et al. Incidence of Neonatal Hypothermia in the Newborn Nursery and Associated Factors. JAMA Netw Open. 2023;6(8):e2331011-e.