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Short-Term Results of Preterm Infants and Comparison with the Recent International Network: Obtained from a Level III Neonatal Intensive Care Unit in Türkiye

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Abstract

Objective: This study aimed to evaluate the effects of developments in neonatal units over time by comparing the results of the last 15 years of our unit with recent reliable international data.

Methods: This study uses data from preterm infants and very-low-birth-weight infants enrolled in the Vermont Oxford Network (VON) system in a standard way. Our unit's 15-year data (from 2005 to 2020) and VON data (for 2018) were compared in 3 subgroups of gestational age (<24 week, 24-26 week, and 27-29 week).

Results: In the data of our unit, prenatal care ($P = .019$) and antenatal steroid administration ($P < .001$) were lesser than VON data, while the frequency of small for gestational age ($P < .001$), cesarean delivery ($P = .001$), and multiple pregnancies ($P < .001$) were higher. In our unit's data, survival ($P < .001$) and morbidity-free survival ($P < .001$), respiratory distress syndrome ($P = .008$), surfactant treatment ($P = .036$), bronchopulmonary dysplasia ($P < .001$), discharge home with oxygen ($P < .001$), and nasal CPAP use before intubation at initial resuscitation ($P < .001$) were lesser than VON data. In the 15-year data of our unit, the frequency of severe intraventricular hemorrhage ($P = .001$) and nosocomial infection ($P < .001$) were found to be higher and patent ductus arteriosus ($P < .001$), and necrotizing enterocolitis ($P = .022$) were lower than VON 2018 data.

Conclusion: As a result, we believe that neonatal intensive care unit (NICUs) need to store their data with a standard method and compare them with a database of a network to have a more critical view of the standards of health care that they provide.

Keywords: Neonatology, maternal-fetal medicine, morbidity, mortality, short-term outcomes

Introduction

Mortality and morbidity rates of preterm infants are the main features of the quality of health services in neonatal intensive care units (NICUs). In recent years, it has been known that there have been significant improvements in the outcomes of preterm infants. These improvements reflect developments in antenatal, perinatal, and postnatal care in NICUs.[1] It is essential to monitor and compare the clinical outcomes of local data with international standards in terms of mortality and morbidity. The Vermont Oxford Network (VON), one of the leading neonatal databases, has been collecting and allowing comparison of very low birth weight (VLBW) infants in appropriate neonatal units from around the world since 1989.[2] This data system provides opportunities for comparisons between hospitals, regions, and countries to improve their healthcare practices.

It has been reported that disparities in healthcare practices between institutions result in differences in mortality and morbidity rates in neonatal units.[3] Differences between the basic characteristics of mothers and babies, hospital infrastructure, immediate intensive care or referral of extremely preterm infants to another hospital, social factors, differences in race, and clinical care practices have been shown as factors affecting the survival and morbidity of newborns.[4-7] New evidence is constantly emerging in medicine regarding neonatal intensive care, but how this evidence is translated into practice among healthcare providers is one of the primary important factors influencing mortality and morbidity outcomes.[8] A recent multicenter national study highlighted the importance and value of standardized monitoring of data in neonatal units followed by the development of national projects.[9]

This study is planned to evaluate the effects of changes and developments in neonatal units over time on short-term outcomes of preterm infants. For this reason, we aimed to evaluate our unit's 15-year VON data (the prenatal, natal, and postnatal observations, and short-term morbidities) between 2005 and 2020 and compare it with the 2018 data of the whole network registered in the VON system.

Methods

Study Groups

Vermont Oxford Network participants enter their standardized data in the VON system for newborns with a birth weight of 401 to 1500 g or a gestational age of 22 weeks to 29 weeks,

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born at a member hospital, or admitted within 28 days of birth before being discharged. Our study group was composed of preterm infants born earlier than 29 weeks + 6 days, regardless of birth weight, and followed in the neonatal unit of İstanbul University-Cerrahpaşa (IUC) and enrolled in the VON system. All data were gathered using uniform definitions set in the VON system throughout the working period and were automatically checked for quality and completeness at submission. The data from 578 preterm infants treated in our neonatal unit between January 1, 2005, and December 31, 2019, were divided into 3e groups of weeks of gestation (<24 week, 24-27 week; 27-29 week) and compared with the data of 40 781 patients enrolled in the VON system between January 1, 2018, and December 31, 2018. We obtained consent from the patients and caregivers for this study.

The approval of ethics was acquired from the İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine Ethics Committee (Approval No: 147975, Date: July 28, 2021).

Definitions

The "Nightingale Data Definitions" guide was used for all definitions.[10] Fenton growth charts were used, and birth weight below the tenth percentile for gender and gestational age was defined as small for gestational age (SGA).[11] Information about antenatal steroid use, multiple pregnancies, gender, Apgar score, and method of delivery was obtained by scanning the mother's file.

In our study, severe intraventricular hemorrhage (IVH) and retinopathy of prematurity (ROP) were defined as grade 3 or 4 and as stages 3, 4, or 5, respectively. Bronchopulmonary dysplasia (BPD) was defined as additional oxygen needed at postmenstrual 36th gestational week or oxygen at discharge if discharged at weeks 34 or 35, and pneumothorax was defined as extra pleural air diagnosed by chest radiograph or needle aspiration. For necrotizing enterocolitis (NEC), we used stage ≥2 of Bell's criteria, and our definition of nosocomial infection was based on bacterial or fungal infections that developed after the third day of life which were demonstrated in blood culture.[12-16]

Patent ductus arteriosus (PDA) was accepted to be present if at least one of the signs "left to right or bilateral ductal shunt on Doppler echocardiography, systolic or continuous murmur" and at least any 2 of the signs "'hyperdynamic precordium, throbbing pulses, large pulse pressure, pulmonary vascular congestion-card iomegaly or both'' were present.[12]

The survival rate was defined as newborns surviving until discharge. Mortality and morbidity rates include all cases, including those in the first week of life. Short-term outcomes of the cases were analyzed for all surviving newborns. Morbidity-free survival was defined as survival without morbidities of severe IVH, periventricular leukomalacia (PVL), BPD, NEC, pneumothorax, or any nosocomial infection. Respiratory distress syndrome (RDS) was defined as clinical and radiological features within the first 24 hours of life.[12,17,18] The length of stay in the hospital was the number of days from the date of admission of the infant to the date of first discharge (dead or alive).[12]

Statistical Analysis

Statistical analysis was done using the Statistical Package for Social Sciences version 21.0 software (IBM Corp.; Armonk, NY, USA). The conformity of the variables to the normal distribution was evaluated with Kolmogorov–Smirnov and Shapiro–Wilk tests, Q-Q plots and histogram graphs. As a result of the analysis, normally distributed variables were shown as mean ± standard deviation, and non-normally distributed variables were shown as median (minimum–maximum). Categorical data were presented with frequency (percentage). Comparisons of 2 groups in continuous data were made with the Mann–Whitney *U*-test when the data were not normally distributed. The categorical data were compared with the Pearson chi-square test. We used the post-doc Bonferroni test to detect statistically significant differences between multiple categorical variables when the number of observations was sufficient and with Fisher's precision test when the number of observations was insufficient. The correlation between continuous data was evaluated with the Pearson correlation test for those with normal distribution and the Spearman correlation test for those not normally distributed. The relationship between categorical data was examined with the Phi correlation test. $P < .05$ was considered significant.

Results

Study Group

We compared the data of 578 premature infants hospitalized in our unit between 2005 and 2020 with the data of 40 505 preterm infants belonging to VON 2018. The distribution of all cases according to the gestational week is given in Table 1. For IUC and VON, the median day of discharge was 62 and 65 days, respectively, and the mean weight at the discharge home was found to be 1977 and 2920 grams, respectively.

Perinatal Demographic Characteristics

The comparison of the 2 data sets revealed that while prenatal care (IUC: 93% vs. VON: 95.2%, $P = .019$) and antenatal steroid use (61% vs. 84.6%, $P < .001$) rates were higher in the VON system, the frequency of cesarean section delivery (74.3% vs. 67.6%, $P = .001$), multiple gestations (30.7% vs. 23.4%, $P < .001$), and SGA (17.2% vs. 10.5%, $P < .001$) were higher in the IUC group. However, no difference was observed in gender, and the fifth-minute Apgar score was <4 (Table 2).

Pulmonary Morbidities

We compared the preterm infants in the VON system to those in IUC in terms of pulmonary morbidities and found that RDS (80.7% vs. 84.9%, $P = .008$), surfactant use (68.1% vs. 72.2%, $P = .036$), nasal continuous positive airway pressure (CPAP) or nasal ventilation use before intubation (16.5% vs. 56.4%, $P < .001$), BPD (22.3% vs. 34.9%, $P < .001$), and oxygen requirement at discharge home (2.2% vs. 18.1%, $P < .001$) were higher in the VON and we found no difference regarding pneumothorax rate (6.2% vs. 5.7%, .633) in the IUC (Table 3).

Table 1. Frequencies of Infants Born at Different Gestational Ages at IUC (2005-2019) and Vermont Oxford Network (2018)

	Number (%) of Infants	
Gestational Age (Weeks)	**IUC (2005-2019) (n = 578)**	**Vermont Oxford Network (2018) (n = 40505)**
<24	32 (5.5)	3888 (9.6)
24-26	165 (28.5)	13915 (34.4)
27-29	381 (65.9)	22702 (56.0)

IUC, İstanbul University Cerrahpaşa.
*$P < .001$.
*Chi-square test.

Table 2. Demographic Features and Perinatal Information of Infants Born at IUC (2005-2019) and Vermont Oxford Network (2018)

	Gestational Age (Weeks) IUC Patients					
Outcome	**<24**	**24-26**	**27-29**	**Total IUC (2005-2019)**	**Total Vermont (2018)**	***P****
Male	19/32 (59.3)	82/165 (49.6)	204/381 (53.5)	305/578 (52.8)	21346/40505 (52.7)	.974
Prenatal care	29/30 (96.7)	130/148 (87.8)	316/333 (94.9)	475/511 (93.0)	38367/40301 (95.2)	.019
Antenatal steroids	5/29 (17.2)	85/145 (58.6)	206/311 (66.2)	296/485 (61.0)	34067/40269 (84.6)	<.001
Cesarean section	10/32 (31.2)	100/165 (60.6)	319/379 (84.1)	428/576 (74.3)	27377/40498 (67.6)	.001
Apgar 5-min <4	18/32 (56.2)	29/157 (18.5)	29/361 (8.0)	76/550 (13.8)	4541/39837 (11.4)	.077
Multiple gestations	13/32 (40.6)	48/165 (29.1)	117/382 (30.6)	178/579 (30.7)	9480/40514 (23.4)	<.001
SGA	4/30 (13.3)	30/165 (18.2)	65/381 (17.1)	99/576 (17.2)	4201/40015 (10.5)	<.001

All data are given as number/total (percentage). Bold values indicate statistical significance ($P < .05$).
SGA, small for gestational age; IUC,İstanbul University Cerrahpaşa.
*Chi-square test.

Table 3. Pulmonary Morbidities According to Gestational Age at IUC (2005-2019) and Vermont Oxford Network (2018)

	Gestational Age (weeks) IUC patients					
Outcome	**< 24**	**24-26**	**27-29**	**Total IUC (2005-2019)**	**Total Vermont (2018)**	***P****
RDS	24/27 (88.9)	128/150 (85.3)	270/346 (78.0)	422/523 (80.7)	33071/38953 (84.9)	.008
Surfactant at any time	23/32 (71.9)	110/153 (71.9)	230/348 (66.1)	363/533 (68.1)	29179/40414 (72.2)	.036
Nasal CPAP or nasal ventilation use before intubation at initial resuscitation	0	5/50 (10)	28/150 (18.7)	33/200 (16.5)	21956/38930 (56.4)	<.001
Pneumothorax	2/27 (7.4)	13/148 (8.8)	17/342 (5.0)	32/517 (6.2)	2221/38972 (5.7)	.633
BPD	0	21/57 (36.8)	42/225 (18.7)	63/282 (22.3)	11158/31970 (34.9)	<.001
Oxygen-at discharge home	0	3/53 (5.7)	3/218 (1.4)	6/271 (2.2)	5060/27958 (18.1)	<.001

All data are given as number/total (percentage). Statistically significant parameters are shown in bold ($P < .05$).
BPD, bronchopulmonary dysplasia; CPAP, continuous positive airway pressure; RDS, respiratory distress syndrome; IUC, İstanbul University Cerrahpaşa.
*Chi-square test.

Other Morbidities

The frequency of nosocomial infection (24.5% vs. 14.6%, $P < .001$) and severe IVH (17.8% vs. 11.1%, $P < .001$) were lesser than the VON data, but PDA (17.1% vs. 34.3%, $P < .001$) and NEC (3.7% vs. 6.1%, $P = .022$) were lower in the IUC system data. No difference was observed in the frequency of ROP (10.9% vs. 8.1%, $P = .112$) (Table 4).

Survival, Morbidity-Free Survival

When compared with our data, the survival (56.6% vs. 80.8%, $P < .001$) and the morbidity-free survival (35.0% vs. 43.6%, $P < .001$) were higher than those of the VON group. While the survival under 24 weeks of gestation was 0 in our unit, it was found to be 35.9% in the VON group and survival without morbidity was 4.7%. The survival frequency between 24-26 weeks of gestation was 37.9% in our unit and 75.3% in the VON group. The frequency of survival without morbidity was found to be 16.7% in IUC and 25.4% in the VON for this group of gestational age. The survival frequency between 27-29 weeks of gestation was 69.9% in our unit and 91.9% in the VON group, and survival without morbidity was also higher in VON (46.8% vs. 61.4%) (Table 5).

Discussion

In our study, the 15-year data of a single center, enrolled in the VON system, was compared with the 2018 data of the entire VON system. Each NICU needs to have its results, especially for parental counseling. Few studies have been reported comparing local and international data over a period, using the data stored in a standard way in the same database.[3,19,20] In this study, we found that methods with proven effects on neonatal mortality and morbidities, such as prenatal care, antenatal steroid use, surfactant, and pre-intubation non-invasive ventilation (NIV) use, are used less frequently in our unit compared to international records.[5,7,21,22] We planned to share the data of our study and the areas to be developed with the entire neonatal and perinatology team for the precautions to be taken. After this sharing, we planned to make plans about the areas that were found insufficient as a result of the study and to publish the results compared with the method in this study in the next years. The results of this

Table 4. Other Neonatal Morbidities According to Gestational Age at IUC (2005-2019) and Vermont Oxford Network (2018)

	Gestational Age (Weeks) IUC Patients					
Outcome	**<24**	**24-26**	**27-29**	**Total IUC (2005-2019)**	**Total Vermont (2018)**	***P***
Nosocomial infection	0/3	23/89 (25.8)	69/283 (24.4)	92/375 (24.5)	5361/36721 (14.6)	<.001
NEC ≥ 2	0/27	6/148 (4.1)	13/342 (3.8)	19/517 (3.7)	2377/38971 (6.1)	.022
PDA	0/27	30/146 (20.5)	58/342 (17.0)	88/515 (17.1)	13332/38868 (34.3)	<.001
Severe IVH	0/4	23/83 (27.7)	27/194 (13.9)	50/281 (17.8)	4025/36269 (11.1)	<.001
Severe ROP	0	13/51 (25.5)	13/187 (7.0)	26/238 (10.9)	2476/30573 (8.1)	.112

All data are given as number/total (percentage). Statistically significant parameters are shown in bold ($P < .05$).
IVH, intraventricular hemorrhage; NEC, necrotizing enterocolitis; PDA, patent ductus arteriosus; ROP, retinopathy of prematurity; IUC, İstanbul University Cerrahpaşa.
*Chi-square test.

Table 5. Overall Survival and Morbidity-Free Survival Rates at IUC (2005-2019) and Vermont Oxford Network (2018)

		Gestational Age (weeks) of patients					
Outcome		**<24**	**24-26**	**27-29**	**Total IUC (2005-2019)**	**Total Vermont (2018)**	***P****
Survival	IUC	0/32	60/158 (37.9)	251/359 (69.9)	311/549 (56.6)	32536/40268 (80.8)	<.001
	VON (2018)	1393/3882 (35.9)	10392/13803 (75.3)	20751/22583 (91.9)			
Morbidity-free survival	IUC	0/32	25/150 (16.7)	153/327 (46.8)	178/509 (35.0)	17507/40155 (43.6)	<.001
	VON (2018)	182/3874 (4.7)	3498/13765 (25.4)	13827/22516 (61.4)			

All data are given as number/total (percentage). Statistically significant parameters are shown in bold ($P < .05$).
IUC, İstanbul University Cerrahpaşa.
*Chi-square test.

study will allow for ameliorating weak points in our healthcare given to very premature newborns.

Perinatal Features

In this study, when the VON data and the perinatal characteristics of the last 15 years of our unit were compared, prenatal care (93% vs. 95.2%) and antenatal steroid (61.1% vs. 84.6%) use were higher in the 2018 data of the VON system (Table 2). It has been reported that both mortality and morbidity decrease with the increase in prenatal care and antenatal steroid use.[21] In a recent Cochrane meta-analysis on the use of antenatal steroids, it was reported that antenatal steroid use increased lung development, diminished the rate of RDS, and decreased the requirement for mechanical ventilation, and decreased mortality. The same meta-analysis found that antenatal steroid use reduced morbidity by decreasing the frequency of IVH, BPD, NEC, and infection developing in the first 48 hours.[22] The differences in prenatal care and antenatal steroid use between VON and our unit's data are likely to be associated with our preterm infants' higher mortality and morbidity rates (increased severe IVH and severe ROP). Prenatal care means regular monitoring of pregnant women. We suppose that the low frequency of antenatal steroid application is due to gynecologists' attitude towards prenatal steroids, and it was specifically reviewed in our previous study that this attitude has changed significantly over time.[23]

In the data of our unit, the frequencies of multiple gestations (30.7% vs. 23.4%) and SGA (17.2% vs. 10.5%) were higher than those of the VON group. According to the results of our study, it had been reported that there was a relationship between the increase in the frequency of multiple pregnancies and that of SGA.[24] It has been shown that newborns born with SGA are related to complications such as prematurity, neonatal asphyxia, hypothermia, hypoglycemia, hypocalcemia, polycythemia, sepsis, and death.[25] However, some studies also argue that SGA decreases mortality by increasing maturation.[26] A recent comprehensive study reported that multiple pregnancies increased mortality and morbidity.[27] Fermin García-Muñoz et al,[28] who examined factors associated with survival and survival without major morbidity, showed that birth weight, SGA, female sex, multiple gestations, and less invasive resuscitation were independent risk factors for neonatal outcomes. The high frequency of both SGA and multiple gestations in our unit was likely to contribute to the higher incidence of mortality and morbidity rates. This local data from our unit will guide us in defining premature newborns with a higher risk when discussing with their parents. Additionally, we also assume that the reason for the higher discharge weights in the VON group is that patients with a gestational age below 24 weeks need a longer hospital stay, the discharge criteria of the units change over time, and SGA cases are less common in the VON group.

Pulmonary Morbidities

In terms of pulmonary morbidities, when the data of the last 15 years of our unit were compared with the 2018 data of the VON system, RDS (80.7% vs. 84.9%), surfactant use (68.1% vs. 72.2%), nasal CPAP use before intubation at initial resuscitation (16.5% vs. 56.4%), BPD diagnosis (22.3% vs. 34.9%), and discharge home with oxygen (2.2% vs. 18.1%) were lesser than our unit. However, no difference was detected in terms of pneumothorax frequency (Table 3). The latest RDS guidelines emphasize the importance ofNIV before intubation and surfactant treatment of preterm infants diagnosed with RDS.[29] Gupta et al. also recently found an association between mortality and the RDS required for surfactants.[26] The higher incidence of surfactant use in VON data is probably related to the higher incidence of RDS diagnosis. A higher incidence of RDS diagnosis in VON data can be explained by significantly more premature newborns in the database compared to the results of our unit. It has been reported in the literature that as the gestational age decreases, the frequency of RDS, surfactant use, and the rate of BPD increase.[30,31]In the recently published study data of our unit where we compared the differences in our unit in 2 periods, we found a significant increase in the use of surfactant in time without a significant change in the frequency of RDS diagnosis.[23] This can be explained by the easier availability of surfactants in developing countries and more regular use with developed local guidelines.[32] A recent study by Rodrigo, Fermin Garcia-Muñoz et al showed that less invasive resuscitation was shown as an independent risk factor affecting neonatal outcomes.[28] We think that using less nasal CPAP in the delivery room, especially in the first years of our data, has contributed to our unit's higher morbidity rates. In a recent study, it was shown that the rate of hospitalization with severe disease findings after discharge (bronchiolitis and pneumonia) is higher in preterm and low birth weight babies compared to term babies.[33] In addition, the reason for the lower incidence of BPD and the rate of being discharged home with oxygen in the 15-year data of our unit was probably closely related to the lower percentage of preterm births under 27 weeks of gestation and a lower survival rate compared to VON 2018 data.

Other Neonatal Morbidities

In terms of other morbidities, the comparison of the 2 data sets showed that the frequencies of nosocomial infection (24.5% vs. 14.6%) and severe IVH (17.8% vs. 11.1%) were found to be higher in our unit, while no difference was observed concerning severe ROP (10.9% vs. 8.1%); the rate of PDA (17.1% vs. 34.3%) and NEC (3.7% vs. 6.1%) was lower than the VON 2018 data.

In the 15-year data of our unit, we observed that antenatal steroids were used less frequently than in the VON group. It had been reported that the use of antenatal steroids prevented IVH by decreasing cerebral blood flow fluctuations.[34] We might expect that an increase in prenatal steroid use would contribute to a decrease in the frequency of severe IVH in our unit. Closer collaboration with perinatologists and better follow-up of pregnancies would probably increase the incidence of our prenatal steroid treatment.

In a study involving many centers in Türkiye, lower body weight, earlier gestational age, increased number of days under total oxygen therapy, late-onset sepsis, high frequency of erythrocyte transfusion, and low weight gain were found to be independent risk factors for severe ROP.[35] We found that the ROP frequency in our unit in the last 15 years was similar to the VON 2018 data. The higher percentage of more mature preterm infants in our data and higher mortality rates probably decreased the incidence of ROP in our unit.

It had been shown that the frequency of PDA increased as the gestational week decreased.[36] According to 2018 VON data, the higher frequency of PDA in preterm babies is most likely due to the higher number of preterms under 24 weeks of gestation in the VON group according to our unit. We showed that NEC frequency was lower in our unit than in the VON 2018 data. In the literature, risk factors for NEC formation are listed as formula feeding, PDA, umbilical catheter, chorioamnionitis, birth asphyxia, intrauterine growth retardation, primary infection, anemia and transfusion, circulatory disorder, H2 receptor blockers, and hyperosmolar agents.[37] The lower frequency of NEC in our unit may be related to the lower frequency of prematurity under 24 weeks and the lower frequency of PDA in our unit data. Another point that contributes to the lower incidence of NEC in our unit is the importance that we give to the expressed milk of mothers for their premature newborns. With the strategies of promoting feeding and the use of expressed mother milk, IUC received the label "Baby-Friendly Hospital" from the Turkish Ministry of Health.

Survival and Survival without Morbidities

Survival (56.6% vs. 80.8%) and morbidity-free survival (35.0% vs. 43.6%) rates were higher in the VON 2018 data compared to the last 15-year data of our unit. In light of all developments in neonatal intensive care in recent years, it has been reported that the survival rate of premature babies has increased in recent years.[21] In another study, evaluating the change in morbidity over the years using VON data, it was found that mortality, BPD, NEC, late neonatal sepsis, severe IVH, and severe ROP decreased over time.[38] Therefore, we were not surprised to find higher mortality and morbidity rates in our unit for the last 15-year period compared to the recent results of VON for the year 2018. In a recent multicenter study in our country, the survival rate in VLBW infants was found to be behind developed countries, but slightly better than in developing countries. In addition, in the same study, the survival rate without major morbidity was found to be better than in developed countries.[9] We showed a similar development in recent data of our unit in our previous study,[23] we attributed these results to the development of neonatal units in our country and especially to the implementation and dissemination of standard methods by the National Neonatal Association.

One of this study's limitations is that the results of our unit in 15 years are compared with the results of only 1 year (2018) VON data. The second limitation might be that the short-term results were multifactorial and therefore all relevant factors might not be adequately evaluated. On the other hand, we thought that the use of data stored in the VON system over 15 years, recorded in a standard way using the same definitions, was an important point of strength.

Conclusion

In conclusion, by comparing the results of a single-center NICU from a developing country with the results of the VON database, we showed that prenatal care, using antenatal steroids, surfactant treatment, and NIV use should be improved in our unit. These actions will probably reduce our pulmonary and other morbidities, mortality, and survival without morbidities. By evaluating the change of data stored in a standard way, such as in the VON system over time, local measures can be taken to provide better healthcare to premature newborns, and the priorities of the unit can be determined.

Ethics Committee Approval: The protocol for the research project has been approved by the İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine Ethics Committee (Approval No: 147975, Date: July 28, 2021) and performed in accordance with the tenets of the Declaration of Helsinki.

Informed Consent: Informed consent was obtained from the patients and caregivers for this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – A.Y., M.V.; Design – A.Y., M.V., Y.P.; Supervision – M.V., Y.P., Materials – A.Y., N.K., Z.A.U., E.U.; Data Collection or Processing – A.Y., N.K., Z.A.U., E.U.; Analysis, or Interpretation – K.S.; Literature Review – A.Y., N.K.; Writing – A.Y., M.V., Y.P.; Critical Review – M.V., Y.P.

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Availability of Data and Materials: The datasets generated and/or analyzed during the current study are not publicly available due to our hospital policy but are available from the corresponding author on reasonable request.

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