The Perinatal Times

Volume 35 | 2025

The Perinatal Outreach Program is a partnership between SSM Health Cardinal Glennon Children's Hospital, SSM Health St. Mary's Hospital -St. Louis, and SLUCare Physician Group. Funding is provided in part by the Illinois Department of Public Health Perinatal Program Grant.

EFM and Infection

By: Nicole Arciniega, MSN, RNC-OB, CLC, CCE

When assessing fetal heart rate in the setting of a maternal infection, it is important to recognize the physiological influences as well as both the benefits and limitations of monitoring. Fetal monitoring can give us insight into a developing maternal response to infection, the fetal response to the infection, and the neonatal risks associated with that response. However, fetal monitoring is not a diagnostic tool. Changes to fetal heart rate presumed to be associated with maternal infection are an indication for further assessment and situationally appropriate interventions should always be performed.

When maternal infections are experienced early in pregnancy it can disrupt the inflammatory and angiogenic environment during initial placental implantation and vascularization. This can cause abnormal physiology affecting maternal and fetal hemodynamics. These abnormalities in development can lead to an increased risk of preterm birth, SGA infants, and stillbirth. (Weckman, et al., 2019) As we further discuss the effects of active infection on fetal heart rate, it is important that we also consider the effects of prior infections on fetal oxygenation and fetal development and view fetal heart rate status and evolution of the patient's fetal heart rate monitoring from a holistic lens.

In the presence of an acute maternal infection, especially when intraamniotic, neonates are at higher risk of neonatal sepsis, preterm birth, and, thereby, all the sequelae that are associated with these complications. Additionally, maternal infection during the labor process can cause a dysfunctional labor pattern and may require increased intervention. (ACOG, 2022) Placental inflammation can also be caused by acute intrapartum infection which can contribute to fetal intolerance to labor secondary to utero-placental insufficiency.

Fetal monitoring interpretation requires a comprehensive understanding of placental physiology and fetal circulation. To know the implications of the fetal response to stress and stimuli we must understand why it is happening.

Due to the possible effects on placental vascularization, implantation, and perfusion, episodic changes indicative of impaired fetal oxygenation are more common in a patient with current or past infection.

A poorly vascularized placenta has less capacity for oxygen reserves, which are a key component for fetal tolerance to the stress of uterine contractions. Late decelerations and decreased variability are more common for patient's experiencing infection. Fetal tachycardia is frequently noted in a febrile patient. Nursing interventions should focus on maximizing fetal oxygenation and mitigating the inflammatory response. Maternal repositioning, hydration, antibiotics, and antipyretic medications may all be indicated. In the presence of tachycardia and decreased variability, with or without episodic changes, providers should prioritize limiting further stress to the fetus. While infection alone is not an indication for c-section, the effects of infection on fetal oxygenation status often warrant intervention and may be an indication for urgent delivery.

Spotlight on EFM and Syphilis

Jarisch-Herxheimer Reaction occurs in up to 44% of acute syphilis cases (Rac, Revell, Eppes, AJOG 2017) and can cause preterm contractions, increased risk of preterm birth, fetal heart rate abnormalities, and in extreme cases, stillbirth. Depending on illness severity, initial penicillin dose may be done inpatient for 24 hours with fetal heart rate assessment appropriate for maternal condition and gestational age.

If not inpatient – patient should be informed about the possible side effects of treatment and counseled properly on when to return (i.e. preterm labor precautions, decreased fetal movement, fever). Nursing considerations include patient education, monitoring as ordered and, if clinically indicated, regular assessment, interventions for decelerations and a plan for delivery that is appropriate for gestational age.

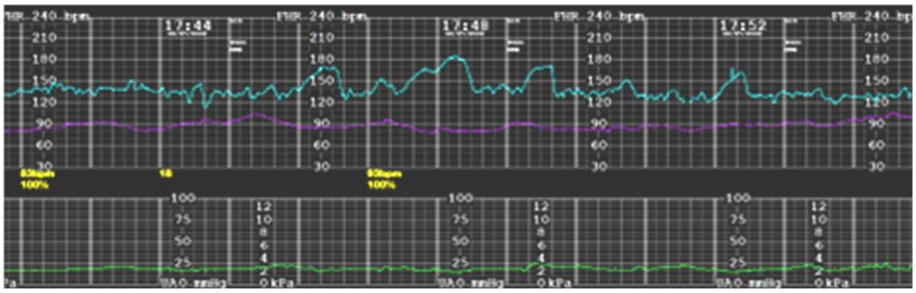
EFM and Infection (cont.)

Case Study

20yo, G1P0 @39.1 weeks. Hx of chlamydia and trichomonas this pregnancy, which were treated. +HSV, with outbreak 1 month before admission and on suppression.

6/7/2024: 1740 Admission VS: BP 142/82, Temp 98.9F, RR 16, SPO2 100%, HR 83 – SVE CL/25/-4. Admitted to L&D for Misoprostol IOL. PCN for GBS+.

Admission Strip

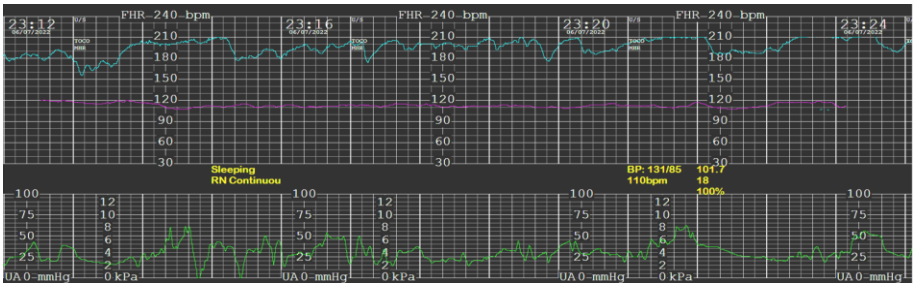


6/7/2024 2320 - 6 hours later VS: BP 131/85, Temp 101.7F, RR 18, SPO2 100%, HR 110.

Treated for Chorioamnionitis – Zosyn and Clindamycin.

EFM Interpretation: Baseline 130, Moderate Variability. Accelerations noted.

Fever Strip

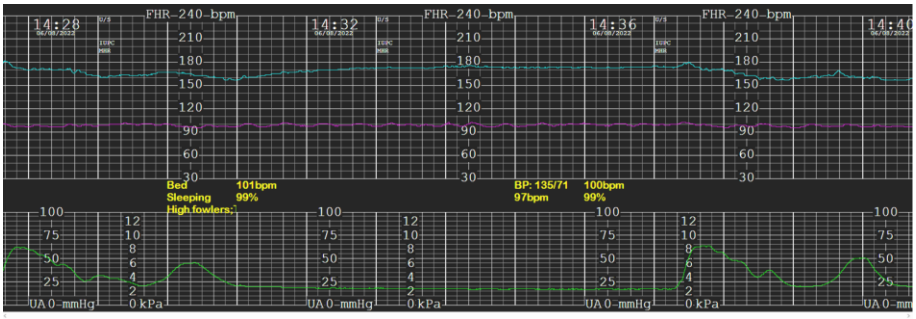


EFM Interpretation: Baseline 185, Moderate variability, Accelerations.

Fever responded to Tylenol. Labor Interventions: Miso x2, Cook Catheter, AROM.

MD at bedside intermittently throughout the day. Patient repositioned, Serial SVEs. IUPC placed. Patient counseled on FHR status and possible need for C-section. Tachycardia continues. Develops decreased variability and Late decelerations.

Decision Strip



Decision for C/S 6/8/2024 1500 VS: 134/75, Temp 97.8F, RR 22, SPO2 99%, RR 103 – SVE 5/60/-3

EFM Interpretation: Baseline 170, Minimal variability, Late and Prolonged Decels noted and not responding to interventions.

Outcome: Primary LTCS, Male infant, 3040g. Apgars $3^{1}/7^{5}$. Arterial Gas: pH - 7.27, PCO2 - 47, BE - 5.4.

NRP in the Know

By: Leslie Powell, MSN, RNC-NIC, Melissa Miller, MSN, RNC-NIC, C-ONQS, & Abby Partridge, BSN, RNC-NIC

Anticipation of 9th Edition Updates

Since 1987, the Neonatal Resuscitation Program (NRP) has become the training standard for health care professionals who manage newborns in the hospital setting (Weiner & Zaichkin, 2021). Subsequently, the content has been reviewed continuously to distribute up-to-date resuscitation science and training tools. From the original publishing of the textbook and its accompanying materials, the content has been officially updated in 1990 (second edition), 1994 (third edition), 2000 (fourth edition), 2006 (fifth edition), 2011 (sixth edition), 2016 (seventh edition), and 2021, with the current eight edition.

Eighth edition changes were largely focused on logistics of the online platform, introducing Resuscitation Quality Improvement (RQI) for NRP, and having two curriculum offerings for NRP Providers: NRP Essentials and NRP Advanced. In anticipation of the upcoming release of NRP, Ninth Edition. First and foremost, it is helpful to understand the process of how updates are discussed, decided upon, and integrated into the NRP curriculum.

The mission of the International Liaison Committee on Resuscitation (ILCOR) is "to promote, disseminate, and advocate international implementation of evidence-informed resuscitation and first aid using transparent evaluation and consensus summary of scientific data" (*International Liaison Committee of Resuscitation*, n.d.). ILCOR is comprised of six task forces, including the Neonatal Life Support Task Force, which conducts systematic reviews, scoping reviews, and evidence updates on questions related to resuscitation of the newborn infant. These reviews serve as the scientific framework for neonatal resuscitation algorithms and educational programs across the world.

ILCOR publishes an annual Consensus on Science and Treatment Recommendation (CoSTR), stating and citing evidence for their recommendations on neonatal resuscitation and care (Weiner, Sept. 26, 2023). At least every 5 years, the American Heart Association (AHA) and American Academy of Pediatrics (AAP) produce comprehensive neonatal resuscitation guidelines based on the ILCOR CoSTR publication, with modifications that reflect the resources available in, and societal values of, the United States. Lastly, in conjunction and collaboration with the publication of updated AHA and AAP comprehensive guidelines, and ILCOR's evidence-based reviews, the multidisciplinary NRP Steering Committee (NRPSC) makes final decisions for the development and implementation of the next edition of the NRP training program, which is used to educate the neonatal work force about the latest newborn resuscitation guidelines.

Umbilical Cord Management

Standardizing neonatal umbilical cord management has been a long-time debate in obstetrics and neonatology. Delayed cord clamping was standard practice for hundreds of years. Erasmus Darwin stated immediate clamping prevents the neonate from receiving all blood meant for their cardiovascular circulation, depriving them of essential physiologic needs, which was later confirmed through research in the 1960s (Mandy, 2016). Research slowed in the 1970s as emphasis was placed on active management of the third stage of labor to prevent maternal hemorrhage, leading to passive discouragement of delayed cord clamping, for fear it could increase maternal risk (Weiner, Sept. 26, 2023). Thus, early editions of NRP did not include umbilical cord management, but focused on ensuring the neonate was safely transferred to the pediatric team for care.

Over the last 30 years, umbilical cord management research has resumed, and new standards have been established. Recent recommendations from ILCOR's 2021 Cord Management CoSTR state to wait at least 60 seconds before clamping for most vigorous term and late preterm neonates, based on meta-analyses of 50-year trials, showing the practice has no effect on maternal hemorrhage (El-Naggar et al., 2021). According to the analyses, at both the 24-hour and 7-day marks, infants with delayed clamping had a higher hematocrit. Polycythemia was noted, though no difference in the need for phototherapy or exchange transfusion was found, nor a higher rate of mortality, when compared to infants whose umbilical cords were immediately clamped. Though current evidence does not highlight significant benefits, no harm or additional costs have been found, so the recommendation remains to delay cord clamping for most vigorous term and late preterm infants with intact placental circulation. Additionally, there was not significant evidence at the time of ILCOR's CoSTR that delayed clamping for preterm infants impacted survival rate, intraventricular hemorrhage (IVH), bronchopulmonary dysplasia, or necrotizing enterocolitis (El-Naggar, 2023). It was found, however, that when compared to preterm infants whose cords were immediately clamped, preterm infants who experienced delayed cord clamping had a higher hematocrit during the first week of life, fewer experienced hypotension requiring inotropes in the first 24 hours, and fewer required blood transfusions. ILCOR concluded there was substantial evidence to recommend delayed clamping for the vigorous preterm neonate. Sufficient evidence was not available at the time of ILCOR's publishing to make a recommendation for infants born non-vigorous.

International Liaison Committee on Resuscitation (ILCOR)

Use the link or QR Code for insight into the aims and structure of ILCOR. Learn about task forces, PICOs, evidence evaluation process, and CoSTR documents.

https://www.youtube.com/watch?v=X7l9cwLX6Ec&t=47s

NRP in the Know (cont.)

8th Edition of NRP echoes the 2021 recommendations and is expected to evolve with any updated recommendations ILCOR provides when the 9th Edition of NRP is published. A recent study, the MINVI Trial, explored the effect of cord milking prior to cutting the umbilical cord, which involves circling the umbilical cord with the thumb and forefinger, gently squeezing, and pushing toward the infant's abdomen (Weiner, Sept. 26, 2023). Those born between 35 and 42-weeks' gestation experienced benefits such as less cardiorespiratory support in the delivery room and a lower incidence of moderate to severe hypoxic ischemic encephalopathy. However, the trial concluded early due to harm noted in neonates born between 23 and 27-weeks' gestation. Repetitive spikes in blood flow and pressure, caused by cord milking, led to unstable blood flow, and put the neonates at a significantly higher risk of severe IVH. ILCOR is evaluating all data, so it is possible it could come up during review for the 9th Edition of NRP.

Physiologic cord clamping for the non-vigorous neonate has also garnered recent attention (Weiner, Sept. 26, 2023). This technique involves leaving the umbilical cord intact upon birth to delay clamping until the infant has been resuscitated, and the lungs inflated. It is meant to mimic the actions of intrauterine placental respiration. The placenta provides oxygenated blood to the infant until birth, when the infant's lungs can then take over. If the cord is clamped prior to the infant's first breath, such as with a non-vigorous neonate who receives immediate clamping, cardiac output and blood oxygen levels could be compromised.

Physiologic clamping allows blood to continue to bypass the lungs during resuscitation, instead continuing through the placenta. The cord is clamped once the infant is breathing, and the lungs are expanded. A study of physiologic cord clamping in lambs noted more stable hemodynamic transition, a smaller decrease in cardiac output at birth, better blood flow to the lungs, less bradycardia, and more stable carotid artery pressures than lambs whose umbilical cords were immediately clamped. An expected barrier to physiologic cord clamping is equipment set up for resuscitation; purpose-built carts, planning, and teamwork could make this practice feasible. ILCOR is awaiting publishing of several large studies, including VentFirst, ABC3, and PCI, all addressing physiologic cord clamping, so it is possible this topic could be addressed in a future ILCOR CoSTR or edition of NRP.

Lastly, the Individual Participant data on Cord Management at Preterm Birth (iCOMP) Collaboration is working on large, patient data-based meta-analyses reviewing all known, published studies on various methods of cord management for the preterm neonate (iCOMP, n.d.). Initial findings have been published, and updates will be made as results are identified. Depending on outcomes of this analysis and others mentioned in this article, ILCOR and NRP could amend current recommendations, adopt new ones, or be provided more evidence for current practice recommendations (Weiner, Sept. 26, 2023).

Oxygen Support in Resuscitation

Oxygen supplementation is commonly used in the delivery room during neonatal resuscitation, and even more commonly for the resuscitation of preterm infants (Kim & Nguyen, 2019). While the provision of oxygen is a life sustaining treatment, evidence shows that repeated and prolonged exposure can lead to oxidative stress, resulting in cell injury and even cell death (Agrawal et. al., 2021).

Premature infants have less antioxidant defenses than their term peers (Weiner, Sept. 26, 2023). This puts premature infants at a greater risk of cell injury related to prolonged exposure to supplemental oxygen (Weiner, Sept. 26, 2023). The goal of resuscitation for the preterm infant is balancing the achievement of normal oxygen saturation levels, as quickly as possible, while preventing over exposure to oxygen or inadequate oxygen supplementation (Kim & Nguyen, 2019).

The ideal concentration of oxygen with which to initiate neonatal resuscitation has not yet been identified. Based on the best evidence available, current NRP guidelines recommend initiating resuscitation with 21% oxygen for infants equal to or greater than 35 weeks' gestation and a range of 21% to 30% for preterm infants less than 35 weeks' gestation (Kim & Nguyen, 2019). Following the initiation of resuscitation, oxygen supplementation should be titrated, as needed, to obtain the target oxygen saturations (Kim & Nguyen, 2019).

Since the release of the 8th edition NRP guidelines, there has been emerging evidence that may impact recommendations for the concentration of oxygen with which to initiate resuscitation for preterm infants. In an individual patient analysis of eight randomized control trials, Ju Lee Oei and colleagues identified that infants less than 32 weeks' gestation had an increased risk of death or severe intraventricular hemorrhage (IVH) if they did not reach an oxygen saturation of at least 80% by five minutes of life (Oei et. al, 2018). Additionally, the data revealed that only half of babies resuscitated with low FiO2 (30% or less) reached oxygen saturations of at least 80% by five minutes of life (Oei et. al, 2018).

With similar interests in neonatal outcomes associated with initial oxygen supplementation in the delivery room, Dekker and colleagues conducted a bi-center randomized control trial comparing the outcomes of infants less than 30 weeks' gestation stabilized at birth with an initial oxygen concentration of 30% and 100% (Dekker et. al, 2019). Results of this trial showed that preterm infants that were initially stabilized at birth with 100% oxygen were less likely to have oxygen saturations less than 80% at 5 minutes of life, took spontaneous breaths quicker, and there was no difference in total oxygen exposure over the first 10 minutes of life, when compared to the infants that were stabilized at birth with 30% oxygen (Dekker et. al, 2019; Weiner, Sept. 26, 2023).

NRP in the Know (cont.)

Additionally, the NETMOTION study, an individual patient network meta-analysis, concluded that the use of high initial FiO2 (greater than or equal to 90%) in the delivery room may be associated with reduced mortality in infants that are born less than 32 weeks' gestation compared to low initial FiO2 (less than or equal to 30%) (Sotiropoulos, 2024).

The TORPIDO 30/60 trial and the HiLo 30-60 trial are two new randomized control trials that compare the outcomes of infants less than 29 weeks' gestation stabilized at birth with an initial O2 concentration of 30% or 60% (Weiner, Sept. 26, 2023). The results of the studies described above paired with the data from these two studies, that are anticipated soon, may further influence the recommendations for supplemental oxygen use for the preterm infant in the delivery room (Weiner, Sept. 26, 2023).

Positive Pressure Ventilation

Effective positive-pressure ventilation (PPV) is the priority in newborn infants who need support after birth and will remain the priority as we prepare for the release of ninth edition NRP guidelines (Byrne et al., 2024). With insight into updates from the recently published *2023 American Heart Association and Academy of Pediatrics Focused Update on Neonatal Resuscitation* we can anticipate reaffirmation of positive-pressure ventilation practices that have been recommended in previous editions along with some potentially new practices (Byrne et a., 2024).

Reaffirmation of previously recommended practices include that it can be beneficial to use a T-piece resuscitator instead of a self-inflating bag for administering positive-pressure ventilation to newborn infants, particularly for preterm infants, a self-inflating bag should be available as a backup in the event of a compressed gas failure as T-piece resuscitators and flow-inflating bags require a compressed gas source to function, the 2-hand face mask hold is an effective intervention to reduce mask leak, and a laryngeal mask airway should be immediately available for neonatal resuscitations (Byrne et. al, 2024; Weiner, Sept. 26, 2023).

New recommendations for practice as it relates to PPV for newborn infants may include use of a CO2 detector with face mask ventilation, use of a video laryngoscope to intubate, raising the bed and having someone lift the baby's lip if using a standard laryngoscope to intubate, and the consideration of a supraglottic airway as the primary interface to administer positive-pressure ventilation instead of a face mask for newborn infants delivered greater than or equal to 34 weeks' gestation (Byrne et al., 2024; Weiner, Sept. 26, 2023).

The SSM Health Perinatal Outreach Program

The Perinatal Outreach Program is a collaborative effort between SSM Health St. Mary's Hospital – St. Louis, SSM Health Cardinal Glennon Children's Hospital, and Saint Louis University School of Medicine.

It is designed to improve outcomes for mothers and babies through educational programs and quality improvement activities for regional perinatal care providers in Eastern Missouri and Southern Illinois.

SSM Health Cardinal Glennon Children's Hospital and SSM Health St. Mary's Hospital – St. Louis are designated by the Illinois Department of Public Health as the Administrative Perinatal Center for Southern Illinois.

Continuing Education Opportunities

Many continuing education opportunities, including traditional lectures, hands-on skills sessions, as well as online presentations are available for perinatal professionals in eastern Missouri and Southern Illinois. For course calendars or more specific information on programs, please visit ssmhealth.com/perinatal outreach, call the Perinatal Outreach Program at 314-577-5317, or send an email to: SSM-PerinatalOutreach@ssmhealth.com

Author Biographies

Nicole Arciniega, MSN, RNC-OB, CLC, CCE is a Maternal Educator in the Perinatal Outreach Department at SSM Health St. Mary's Hospital - St. Louis. This team serves the Eastern half of Missouri and Southern Illinois by providing education, including EFM training, to providers and nurses throughout the region. She also serves as the Missouri Section Chair for the Association of Women's Health, Obstetric, & Neonatal Nurses (AWHONN) and is credentialed to teach the AWHONN's Intermediate Fetal Heart Monitoring Program.

Melissa Miller, MSN, RN, RNC-NIC, C-ONQS in an RN Program Specialist in the SSM Health Cardinal Glennon Children's Hospital Neonatal Intensive Care Unit (NICU). In addition to her responsibilities in the NICU, Melissa partners with the SSM Health Perinatal Outreach department to support outreach initiatives in relation to neonatal healthcare.

Leslie Powell, MSN, RN, RNC-NIC is a Neonatal Outreach Educator, and Abby Partridge, BSN, RN, RNC-NIC is a former Neonatal Outreach Educator, at SSM Health Cardinal Glennon Children's Hospital, serving Eastern Missouri and Southern Illinois by providing education to nurses and providers throughout the regions.

Melissa, Leslie, and Abby are NRP instructors.

References for NRP in the Know

Agrawal, G., Singh Dalal, S., Kumar Garg, A. Kumar, R., Shah, S., & Singh, D. (2021, December). *Clinical practice guidelines: Oxygen therapy in neonates*. National Neonatology Forum, India. https://nnfi.org/assests/upload/usefull-links-pdf/Oxygen_therapy_in_neonates_NNFI_CPG_Dec2021.pdf

Byrne, B. J., Kapadia, V., Anchan, J., Blohowiak, C., del Moral, T., Foglia, E., Fox, J. R., Halling, C., Hardy, S., Sundgren, N., & Yamada, N. (2024). *Neonatal resuscitation program instructor update: Winter 2024*. American Academy of Pediatrics. Link to pdf of Neonatal resuscitation program instructor update: Winter 2024

Dekker, J., Martherus, T., Lopriore, E., Giera, M., McGillick, E. V., Hutten, J., van Leuteren, R. W., van Kaam, A. H., Hooper, S. B., & te Pas, A. B. (2019). The effect of initial high vs. low FiO2 on breathing effort in preterm infants at birth: A randomized controlled trial. *Frontiers in Pediatrics, 7*(504), 1-11. https://doi.org/10.3389/fped.2019.00504

El-Naggar, W., Davis, P.G., Soll, R.F., Costa-Nobre, D.T., de Almeida, M.F., Fabres, J.G., Fawke, J., Foglia, E.E., Guinsburg, R., Hosono, S., Isayama, T., Kawakami, M.D., Kapadia, V.S., Kim, H.S., Liley, H.G., McKinlay, C.J.D., Perlman, J.M., Rabi, Y., Roehr, C.C., . . . Niermeyer, S., on behalf of the ILCOR Neonatal Life Support Task Force (2021). *Cord management at birth for term and late preterm infants*. Retrieved March 17, 2025, from https://costr.ilcor.org/document/cord-management-at-birth-for-term-and-late-preterm-infants-nls-1551-systematic-review.

El-Naggar, W., Davis, P.G., Josephsen, J., Seidler, L., Soll, R., Costa-Nobre, D., Isayama, T., Couper, K., Schmölzer, G., Weiner, G., Liley, H.G., Dawson JA, de Almeida MF, Fabres G, Fawke J, Foglia E, Guinsburg R, Kawakami M, Lee H., . . . Wyckoff, M. H., on behalf of the ILCOR Neonatal Life Support Task Force. (2023). *Cord management at birth for preterm infants. Retrieved March 17, 2025, from* https://costr.ilcor.org/document/cord-management-at-birth-for-preterm-infants-nls-5051-tf-sr.

Individual participant data on cord management at preterm birth. (n.d.). Retrieved October 9, 2024, from https://www.icompstudy.org/.

International liaison committee on resuscitation. (n.d.). Retrieved July 30, 2024, from https://ilcor.org.

Kim, E., & Nguyen, M. (2019). Oxygen therapy for neonatal resuscitation in the delivery room. *Neoreviews,* 20(9), e500-e512. https://doi.org/10.1542/neo.20-9-e500

Mandy, G. T. (2016). Delayed cord clamping: Are we ready to listen to the doctor from 1796? *Journal of Perinatology, 36*, 1-2. https://doi.org/10.1038/jp.2015.148.

Oei, J. L., Finer, N. N., Saugstad, O. D., Wright, I. M., Rabi, Y., Tarnow-Mordi, W., Rich, W., Kapadia, V., Rook, D., Smyth, J. P., Lui, K., & Vento, M. (2018). Outcomes of oxygen saturation targeting during delivery room satilisation of preterm infants. Archives of disease in childhood: Fetal and neonatal edition, 103(5), 446-454. https://doi.org/10.1136/archdischild-2016-312366

Sotiropoulos, J. X., Oei, J. L., Schmölzer, G. M., Libesman, S., Hunter, K. E., Williams, J. G., Webster, A. C., Vento, M., Kapadia, V., Rabi, Y., Dekker, J., Vermeulen, M. J., Sundaram, V., Kumar, P., Kaban, R. K., Rohsiswatmo, R., Saugstad, O. D., & Sidler, A. L. (2024). Initial oxygen concentration for the resuscitation of infants born at less than 32 weeks; gestation: A systematic review and individual participant data network meta-analysis. JAMA Pediatrics, 178(8), 774-783. https://doi.org/10.1001/jamapediatrics.2024.1848

Weckman, A. M., Ngai, M., Wright, J., McDonald, C. R., & Kain, K. C. (2019). The impact of infection in pregnancy on placental vascular development and adverse birth outcomes. *Frontiers in Microbiology*, *10*, 2019. https://doi.org/10.3389/fmicb.2019.01924

Weiner, G. M., & Zaichkin, J. (Eds.). (2021). *Textbook of neonatal resuscitation (8th ed.)*. American Academy of Pediatrics.

Weiner, G. M. (2023, Sept. 26). *The science behind neonatal resuscitation: Past, present, future* [Neonatal resuscitation program topic for level III and IV NICU].

Yamada, N. K., Szyld, E., Strand, M. L., Finan, E., Illuzzi, J. L., Kamath-Rayne, B. D., Kapadia, V. S., Niermeyer, S., Schmölzer, G. M., Williams, A., Weiner, G. M., Wyckoff, M. H., Lee, H. C., & American Heart Association and American Academy of Pediatrics. (2024). 2023 American heart association and American academy of pediatrics focused update on neonatal resuscitation: An update to the American heart association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Pediatrics*, 153(2), e2023065030. https://doi.org/10.1542/peds.2023-065030.

References for EFM & Infection

American College of Obstetricians and Gynecologists. (2022). *Intrapartum management of intraamniotic infection*. ACOG. https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2017/08/intrapartum-management-of-intraamniotic-infectionn

Rac, M. W., Revell, P. A., & Eppes, C. S. (2017). Syphilis during pregnancy: A preventable threat to maternal-fetal health. *American Journal of Obstetrics and Gynecology*, *216*(4), 352-363.

Weckman, A. M., Ngai, M., Wright, J., McDonald, C. R., & Kain, K. C. (2019). The impact of infection in pregnancy on placental vascular development and adverse birth outcomes. *Frontiers in Microbiology*, *10*, 2019. https://doi.org/10.3389/fmicb.2019.01924