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Postnatal Steroid Use to Counter Bronchopulmonary Dysplasia

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Postnatal Steroid Use to Counter Bronchopulmonary Dysplasia

Introduction

Chronic Lung Diseases such as bronchopulmonary dysplasia (BPD) are likely the most feared respiratory complication of premature birth. It is characterized by a cessation in lung development that requires the use of oxygen supplemental oxygen and a ventilator and it can lead to long-term pulmonary and neurologic complications. This is combated with the use of postnatal steroids to act as an anti-inflammatory agent to help improve lung function. However, postnatal steroids have become less and less popular in recent years due to the several complications that can arise with their use. This is especially the case if the steroids are being used inappropriately such as in either inappropriate timing or inappropriate patient selection. However, there is a Web-based BPD estimator developed in 2011 by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) using data from the Neonatal Research Network. According to *Guidelines for the use of postnatal steroids (DART) in patients at risk of developing chronic lung disease (CLD)*, "The estimator uses readily available demographic and respiratory support data to provide objective estimates of risk for BPD of varying severity and for the competing outcome of death." It is suggested that this tool be implemented by health care practitioners to identify which infants would truly benefit from the steroid treatment. The goal of the study being performed at Driscoll Children's Hospital (DCH) is to determine if we can improve the appropriate use of DART therapy by implementing the NICHD estimator.

Chronic Lung Disease and the Risk of Postnatal Steroids

BPD is a type of chronic lung disease caused by disruption of pulmonary development and injury in preterm infants. It can be caused by a multitude of factors including but not limited to; prematurity, fetal growth restriction, maternal smoking, mechanical ventilation, oxygen toxicity, infection, and genetics. It is generally treated using postnatal steroid therapy however as previously stated, the reason for the decline in steroid use in these preterm infants has been due to the fact that it has been determined that the use of these steroids has been associated with several short-term and long-term complications. The short-term complications include hyperglycemia, hypertension, gastrointestinal bleeding, gastrointestinal perforation, and hypertrophic cardiomyopathy. In the long term, studies have shown evidence that this steroid therapy contributes to neurodevelopmental impairment (Eichenwald, 2022).

Conclusion and Next Steps

Thus far in the research project, a quality control study was performed to reduce inappropriate use of DART by utilizing the NICHD BPD Estimator in premature babies at risk of chronic lung disease. This project has shown promise as it was seen that in the past year, the DCH NICU has used steroids inappropriately in 3 out of every 4 babies (Chong, 2022). The next step will be to turn these results into a full clinical study collecting even more data. To make the jump from a quality control study many things will be needed. The most important of which is IRB approval. This is the major item being waited on by the team before moving on. Additionally, it will be important to collect several more data points. The data points that have already been included are:

- Demographic information such as gestational age, birth weight, sex, and race
- Weight at day of life (DOL) 14
- Ventilator type at DOL 14, 21, and 28 days
- FiO₂% at DOL 14, 21, and 28 days

- Risk of death at DOL 14, 21, and 28 days
- Risk of severe BPD at DOL 14, 21, and 28 days
- Combined risk at DOL 14, 21, and 28 days
- Whether or not DART was used
- DOL DART therapy began
- The month DART was used
- Was the use of DART appropriate - yes or no
- Reason for inappropriate use

The data point that will be added for the clinical study are:

- Additional demographic information Demographics - Apgar score at 5 minutes, use of prenatal steroids
- Duration on mechanical ventilation
- Mode of ventilation
- Duration of oxygen
- Discharged on home oxygen - yes or no
- Adverse effects - This will likely be the most valuable addition since the reason steroid use is limited in the first place is due to unwanted effects so if appropriate use of DART can also reduce side effects this could really add to the results of our study. (NEC within a week of DART, culture-proven sepsis within a week of DART, hyperglycemia requiring insulin while on dart)
- Temporal timeline to DART
- Specific steroid used
- Potential other causes of BPD - The NICU DART guideline states that for high-risk BPD patients, other facts should be ruled out before DART therapy is initiated.
- Previous use of DART
- Steroid dose

- Start and stop times of ventilation in relation to DOL

Once all the data above has been collected it will then become possible to get some more definitive results on the use of DART therapy in newborn infants.

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