

The Possible Role of Artificial Intelligence in Deciding Postnatal Steroid Management in Extremely Premature Ventilated Infants

Shabih Manzar¹ and Archana Bottu¹

¹Louisiana State University Health Sciences Center Shreveport School of Medicine

March 21, 2023

The Possible Role of Artificial Intelligence in Deciding Postnatal Steroid Management in Extremely Premature Ventilated Infants

To the Editor,

Clinical decision support (CDS) is continually evolving through machine learning and artificial intelligence¹. CDS has shown a positive effect among physicians in a systematic review and meta-analysis². It has been proposed that preterm infants who are unable to be taken off mechanical ventilation and require postnatal steroids are at an elevated risk of developing bronchopulmonary dysplasia (BPD)^{3,4}. The risk of BPD in these children can be estimated with free online tools. Greenberg et al.⁵ demonstrated the utility of online clinical tools in estimating the BPD risk in extremely preterm (EP) infants. We previously postulated the efficacy of combining the extubation success probability and BPD risk calculation in an EP infant before and after PNS⁶. Based on the anecdotal experience⁶, we can further support using online tools for CDS and PNS management in EP infants. We present an example in favor of our postulation.

A 14-day-old male infant born at 23 weeks of gestation has been on a high-frequency ventilator. The fraction of inspired oxygen (FiO₂) was 0.45, with a mean airway pressure (MAP) of 14 cm H₂O. His blood gas showed a pH of 7.26. His birth weight was 525 grams, and his current weight is 665 grams. PNS use for facilitating extubation with the expectation of decreasing the likelihood of BPD along with the risk of BPD was discussed amongst the neonatal team and parents. The extubation success probability and BPD risk were calculated using the freely available online tool (Figure 1). The results were:

BPD/death risk estimate: Death 15.16%, Grade 3 BPD 13.79%, Grade 2 BPD 39.97 %, Grade 1 BPD 27.54%, no BPD 3.54%

Probability of successful extubation = 7.77%

The results were added to an MS Excel sheet to obtain the decision (Figure 2). Based on low extubation probability (7.77%) and a combined risk of death and grade 3 BPD of 29.39%, a decision was made to consider PNS use. The parents were counseled, and after obtaining their consent, a shared decision was made to start PNS. In a previous study, Hansen et al. (Figure 2) used a > 35% combined score of Death/BPD risk to decide about PNS. With the change in the BPD estimator from 2011 to 2022, we used a 25% cutoff for PNS use. We added an extubation success of < 25% in combination with > 25% risk of death/BPD as a criterion for PNS management in ventilated EP infants.

Using this example, the BPD estimator and extubation success calculator tools can be incorporated into the electronic record system to generate a CDS based on the algorithm extracting the variables from the infant's medical record.

References:

1. Sutton RT, Pincock D, Baumgart DC, Sadowski DC, Fedorak RN, Kroeker KI. An overview of clinical decision support systems: benefits, risks, and strategies for success. *NPJ Digit Med* . 2020;3:17. Published 2020 Feb 6. doi:10.1038/s41746-020-0221-y
2. Taheri Moghadam S, Sadoughi F, Velayati F, Ehsanzadeh SJ, Poursharif S. The effects of clinical decision support system for prescribing medication on patient outcomes and physician practice performance: a systematic review and meta-analysis. *BMC Med Inform Decis Mak* . 2021;21(1):98. Published 2021 Mar 10. doi:10.1186/s12911-020-01376-8
3. Doyle LW, Cheong JL, Hay S, Manley BJ, Halliday HL. Late ([?] 7 days) systemic postnatal corticosteroids for prevention of bronchopulmonary dysplasia in preterm infants. *Cochrane Database Syst Rev* . 2021;11(11):CD001145. Published 2021 Nov 11. doi:10.1002/14651858.CD001145.pub5
4. Htun ZT, Schulz EV, Desai RK, et al. Postnatal steroid management in preterm infants with evolving bronchopulmonary dysplasia. *J Perinatol* . 2021;41(8):1783-1796. doi:10.1038/s41372-021-01083-w
5. Greenberg RG, McDonald SA, Laughon MM, et al. Online clinical tool to estimate risk of bronchopulmonary dysplasia in extremely preterm infants [published online ahead of print, 2022 Jun 21]. *Arch Dis Child Fetal Neonatal Ed* . 2022;fetalneonatal-2021-323573. doi:10.1136/archdischild-2021-323573
6. Manzar S. Cerebral palsy and postnatal steroids [published online ahead of print, 2023 Mar 5]. *Acta Paediatr* . 2023;10.1111/apa.16742. doi:10.1111/apa.16742

Authors:

Archana Bottu, MD¹

Shabih Manzar, MD, MPH²

Louisiana State University Health Sciences Center at Shreveport

¹Intern, Department of Pediatrics

²Faculty, Department of Pediatrics

Corresponding author

Shabih Manzar, MD, MPH

Louisiana State University Health Sciences Center at Shreveport

1501 Kings Hwy, Shreveport, LA, 71103

Phone: 318-675-7275

Fax: 318-675-6059

Email: shabih.manzar@lsuhs.edu

Author contribution:

Dr. Bottu and Dr. Manzar conceptualized the study and wrote the draft.

Funding and financial support: None

Conflict of interest: None

Figure legends:

Figure 1:

Panel A: The risk estimator for Bronchopulmonary Dysplasia (BPD)/Death.

Panel B: The Extubation success rate calculator

The screenshots are taken from the freely available online (used for non-commercial, educational purposes only)

