THE ROLE OF POSTNATAL GROWTH AND CLINICAL PREDICTION MODELS IN THE EARLY IDENTIFICATION OF SEVERE RETINOPATHY OF PREMATURITY

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Introduction

Retinopathy of prematurity (ROP) remains an important cause of preventable visual impairment among infants born prematurely. The development of effective screening strategies has become increasingly important as improvements in neonatal intensive care have increased the survival of extremely preterm and very low birth weight infants. Although gestational age and birth weight remain central to identifying infants at risk, these characteristics do not fully explain why some infants develop severe ROP while others with similar birth characteristics do not. Postnatal growth has attracted considerable attention as a potential indicator of retinal development and neonatal health. Inadequate weight gain may reflect nutritional difficulties, systemic illness, or a complicated neonatal course. Prediction models that combine birth characteristics with postnatal growth and clinical variables have therefore been developed to improve early identification of infants at risk of severe or treatment-requiring ROP. Nevertheless, their performance and applicability may vary between populations.

Objective

To evaluate the potential contribution of postnatal growth and clinical prediction models to the early identification of severe ROP in preterm infants and to discuss their implications for individualized ophthalmological screening.

A narrative synthesis was undertaken using the supplied review article and the studies cited within it. The analysis focused on postnatal weight gain, birth weight, gestational age, duration of parenteral nutrition, and the performance of established ROP prediction models. Particular attention was given to DIGIROP, WINROP, and G-ROP, including reported sensitivity, specificity, and external validation findings. Evidence concerning treatment-requiring ROP was considered separately from evidence addressing any-stage disease whenever the reported outcomes allowed this distinction. No new clinical observations, patient-level calculations, or original statistical analyses were performed.

The reviewed evidence suggests that postnatal growth can contribute useful information to ROP risk assessment beyond conventional birth characteristics. Infants who experience inadequate weight gain may have a greater likelihood of developing ROP, although poor growth should be interpreted as a clinical indicator rather than an independent cause of the disease. Nutritional difficulties frequently coexist with extreme prematurity, respiratory morbidity, infection, and other complications that may influence retinal vascular development. The duration of parenteral nutrition provides another example of the potential value of information collected during hospitalization. Findings from a Swedish study involving more than 11,000 screened infants indicated that parenteral nutrition lasting at least 14 days was associated with increased odds of both any ROP and severe ROP requiring treatment. Incorporating this variable into revised DIGIROP models helped refine risk stratification while maintaining high sensitivity. These findings support the importance of updating risk assessments as additional clinical information becomes available. Several prediction models have demonstrated promising results.

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DIGIROP incorporates birth characteristics and, in its screening versions, additional information obtained after birth. Validation in a contemporary Swedish cohort showed an area under the receiver operating characteristic curve of 0.93 for the birth model and values ranging from 0.93 to 0.97 for screening models. Such results suggest that combining relevant clinical variables can provide effective discrimination between infants with different levels of risk within the studied population. The G-ROP approach emphasizes postnatal growth and clinical screening criteria. A systematic review and meta-analysis published in 2026 reported a pooled sensitivity of 0.99 for identifying type 1 ROP. However, specificity was considerably lower. This finding illustrates a central challenge in screening: a model may identify nearly all infants who develop sight-threatening disease while still classifying many infants without the outcome as requiring examination. Consequently, high sensitivity alone does not establish that a prediction model can safely replace established screening protocols. The wider evidence also demonstrates that model performance may differ across clinical settings. A 2025 systematic review and meta-analysis of 28 prediction-model studies, involving 72,991 infants, reported encouraging predictive performance but considerable heterogeneity. Limitations included retrospective study designs, inconsistent predictor definitions, potential confounding, and insufficient external validation. These methodological concerns are important because a model that performs well in one neonatal population may not maintain the same accuracy in another.

Postnatal growth and clinical prediction models offer an opportunity to move from static risk classification toward individualized assessment. Gestational age and birth weight are available immediately after delivery, whereas weight gain, nutritional support, and neonatal complications provide additional information over time. Combining these variables may help clinicians recognize changes in risk that cannot be anticipated from birth characteristics alone.

Nevertheless, prediction models should be introduced cautiously. Their clinical value depends not only on statistical performance but also on the consequences of incorrect classification. False-negative results may lead to missed or delayed examinations, potentially allowing sight-threatening disease to progress. Conversely, low specificity may increase the number of examinations required, adding demands for families and healthcare services.

External validation is therefore essential before a model is adopted in a new population. Differences in neonatal care, infant survival, nutritional practices, and existing screening criteria must be considered. Local validation may be particularly valuable in healthcare systems where the characteristics of preterm infants and available neonatal resources differ from those of the populations used to develop existing models.

Conclusion

Postnatal growth and clinical prediction models may improve the early identification of preterm infants at risk of severe ROP. Incorporating weight gain, nutritional support, and selected neonatal variables alongside gestational age and birth weight provides a more comprehensive assessment of risk. DIGIROP and G-ROP have demonstrated promising performance, but differences in specificity and uncertainty about generalizability remain important limitations. These tools should complement, rather than automatically replace, established ophthalmological screening. Further prospective research and population-specific validation are required to establish their safety and practical value in routine neonatal care.

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