

P00.00 Beyond cervical length: how deep learning is redefining ultrasound-based preterm birth prediction

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Introduction

Cervical length measurement remains the cornerstone of ultrasound-based preterm birth (PTB) screening, yet its predictive accuracy is modest. Emerging artificial intelligence models are extracting features from cervical ultrasound images that go far beyond a single linear measurement. This review maps how deep learning is transforming ultrasound-based PTB prediction and what it sees that the human eye cannot.

Methods

A scoping review (PRISMA-ScR) was conducted searching PubMed and Web of Science through May 2025. Studies applying AI to PTB prediction were included if they reported original peer-reviewed research with detailed methodology and performance metrics.

Results

Eighteen studies were identified. Deep learning models applied to transvaginal cervical ultrasound consistently outperformed cervical length alone. Convolutional neural networks analysing dynamic cervical tissue echotexture and funnelling patterns from video sequences achieved areas under the curve (AUC) 0.92, sensitivity 0.88 and specificity 0.90, compared to AUCs of 0.60–0.70 reported for cervical length in similar populations. Models captured subtle textural and morphological changes invisible to conventional measurement, including cervical stiffness surrogates and internal os geometry. Explainability mapping revealed that predictive signal extended beyond the internal os into the cervical stroma, challenging current measurement conventions. Integration of ultrasound features with clinical variables further improved discrimination.

Conclusion

Deep learning unlocks cervical ultrasound information that standard biometry discards. This

paradigm shift from measurement to image intelligence could redefine second trimester PTB screening.

Prospective multicentre trials with standardised acquisition protocols are urgently needed to translate these findings into clinical practice.