

Slowing fetal growth velocity plus Umbilical Artery Pulsatility Index can flag increased risk of unsuspected fetal growth restriction

TM MacDonald, C Jamieson-Grigg, P Kalinowski, L Harbinson, S Tong, SP Walker

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Background

- Fetal growth restriction (FGR) is a major risk factor for stillbirth¹. Detection of FGR reduces stillbirth risk¹, and being <3rd centile is diagnostic of FGR²
- But selective ultrasound fails to detect **most** fetuses subsequently born at <3rd centile³
- Slowing fetal growth velocity (as estimated fetal weight (EFW) z-score/week) predicts birthweight <3rd centile in fetuses classified as appropriate-for-gestational-age (AGA; EFW ≥10th centile)⁴

Hypothesis

- Fetal growth velocity **PLUS** Umbilical Artery Pulsatility Index (UA PI) **together** can improve detection of birthweight <3rd centile in AGA fetuses.

Population

- Patients with: ≥2 scans with biometry performed, between 18-39 weeks (including the routine morphology scan), and ≥2 weeks apart;
- AND with a “normal” last scan prior to birth** (EFW ≥10th centile; **AND** UA PI <95th centile)

Predictors tested (*as continuous variables*)

- Fetal growth velocity (FGV)** (between first and last scans; as EFW z-score change per week)
- Umbilical Artery resistance** (UA PI as gestation-adjusted z-score at last scan)
- Fetal size (EFW)** (as EFW z-score (Hadlock) at last scan)
- Gestation (GA)** (exact gestation, to the day, at which last scan performed)

Outcome of interest

- Detection of birthweight <3rd centile; compared by area under the ROC curve (AUC) (*Table 1*)

Results

- N = 19,772 pregnancies
- All continuous predictors were significantly associated with birthweight <3rd centile individually
- When all 4 parameters were combined together, the best predictive performance was achieved

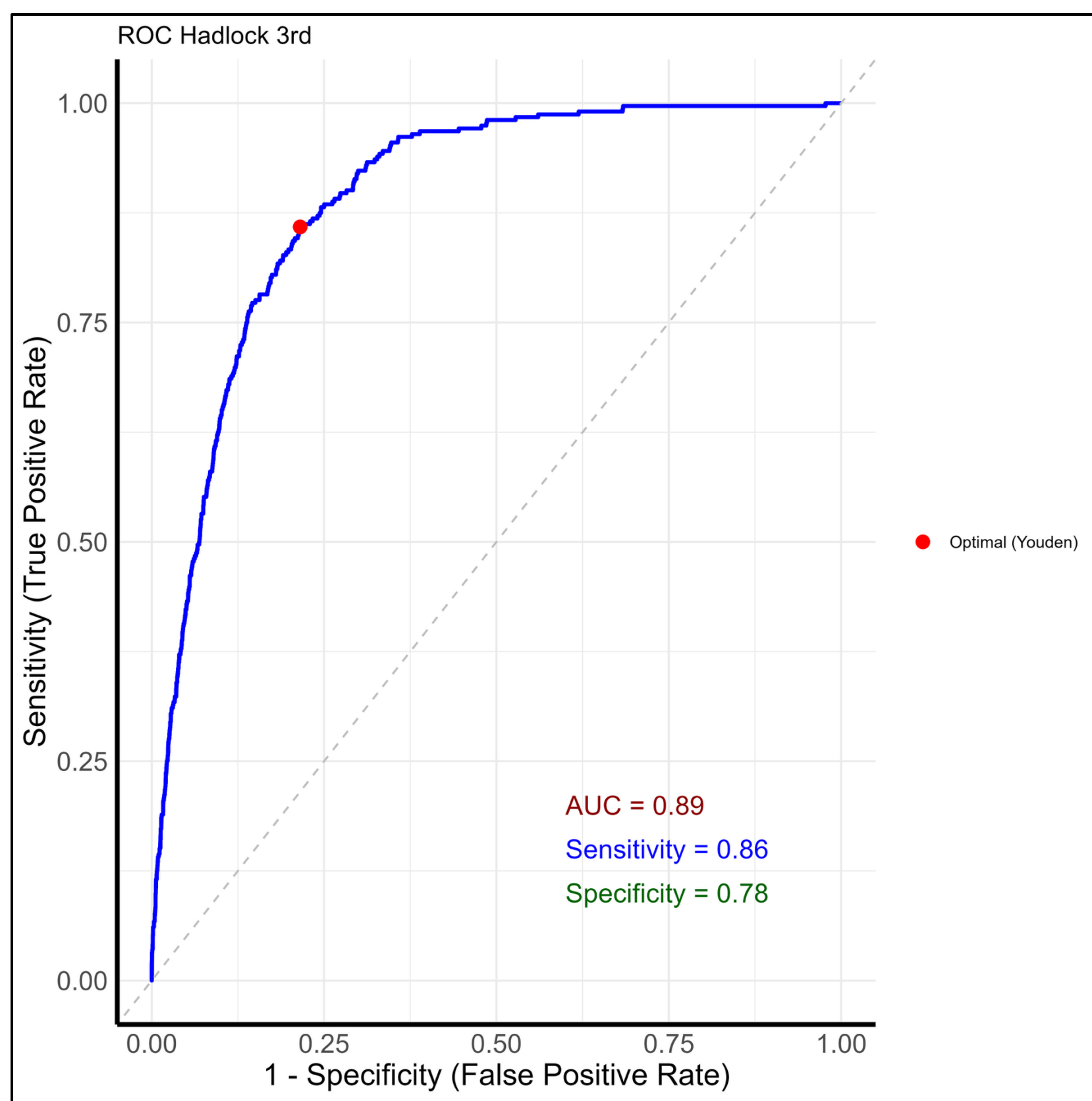
Predictors	AUC
FGV alone	0.62
FGV + UA PI	0.66
FGV + UA PI + EFW + GA	0.89

Table 1. AUC for birthweight <3rd centile in cohort of “normal” growth scans depending on predictor combinations

Figure 1:

ROC curve for birthweight <3rd centile when all 4 predictors (fetal growth velocity, Umbilical Artery PI, EFW, & gestation) were combined.

- AUC = 0.89
- 86% sensitivity & 78% specificity (Youden cut-point)



CONCLUSION: 4 variables (EFW, fetal growth velocity, UA PI, gestation) – available at **any growth scan** – together detect FGR risk in the AGA cohort. This model could be rapidly included in routine growth scan reporting to better detect FGR, and to reduce stillbirth risk.

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Refs: 1. Gardosi 2013; 2. Gordijn 2016; 3. Sovio 2015; 4. Jamieson-Grigg 2025



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