

NSW Consensus Statement: Choice of Fetal Biometry Charts

Version 2

April 2023



CLINICAL
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COMMISSION

Introduction

A wide range of fetal biometry charts are used across NSW to summarise findings of third trimester ultrasound growth scans. Pregnant women often have scans performed by different providers and the use of different reference charts can cause confusion with respect to both fetal growth and wellbeing and further management^{1,2,3}.

In accordance with the Safer Baby Bundle Fetal Growth Restriction Care pathway, and to reduce variation across NSW, a panel of Maternal Fetal Medicine (MFM) Specialists met to review the current evidence and test the performance of various ultrasound growth charts in the NSW context.

Recommendations

The group concluded that:

1. Pregnancies should be dated based on a known Last Menstrual Period (LMP) or a first trimester (<14 weeks) ultrasound and dating should be confirmed at the morphology scan.
2. There is no single set of charts that match the NSW population allowing comparison of all biometry (bi-parietal diameter (BPD), head circumference (HC), abdominal circumference (AC), femur length (FL) and estimated fetal weight (EFW)).
3. The following charts should be used by all ultrasound providers in NSW:

Measurement	Recommended chart [#]
Head circumference	ASUM
Abdominal circumference	ASUM
Femur length	Chitty
Estimated fetal weight	Hadlock 3

[#]References for these charts are provided^{1,4,5,6} and the formulas for mean and SD measures are included in Appendix 1.

A description of the assessment used to reach this conclusion is listed in Appendix 2.

4. A fetus with an EFW <10th centile should be considered at risk of fetal growth restriction. A fetus that appears asymmetrical with an AC <10th centile should also be considered to be at risk of fetal growth restriction.
5. A fetus with an EFW >10th centile that has a 50-centile reduction in EFW between two sets of measures four weeks apart should also be considered to be at risk of fetal growth restriction.
6. If multiple third trimester scans are performed, then all data should be plotted together, so that growth velocity can be determined.
7. A fetus identified as being at risk of fetal growth restriction should be managed according to the pathway set out in the Safer Baby Bundle Element 2⁷.
8. In NSW all growth ultrasound assessments require plotting of all measurements on the [NSW Health Fetal Biometry Ultrasound Growth Scan Charts](#), included in Appendix 3.

In addition, the group of MFM specialists concluded there would be value in a local (NSW) multicentre study.

Appendix 1: Chart Formula

Chart	Parameter	Formula
HC (ASUM)	Mean	$-127.91 + (18.494 \times GA) + (0.1699 \times GA^2)$
	SD	IF GA <18 = 7.5; IF GA <29 = 10; IF GA <42 = 12.5 * =
AC (ASUM)	Mean	$-90.946 + (13.204 \times GA) + (0.0469 \times GA^2)$
	SD	IF GA <17 = 5; IF GA <21 = 7.5; If GA <26 = 10; If GA <31 = 12.5; IF GA <36 = 15; IF GA <42 = 17.5 *
FL (Chitty)	Mean	$-32.43 + (3.416 \times GA) - (0.0004791 \times GA^3)$
	SD	$1.06 + (0.05833 \times GA)$
EFW (Hadlock III)	Mean	$10 \wedge (1.326 - (0.00326 \times AC \times FL) + (0.0107 \times HC) + (0.0438 \times AC) + (0.158 \times FL))$
	SD	0.12

GA = gestational age in weeks

*These parameters were derived from the original dataset.⁴

Appendix 2: A description of the assessment used

The working group met to consider which combination of biometry charts to recommend for universal use across NSW.

The group established that there was no single set of charts to suit all biometric measures. They also established that the methodology used for establishing different charts was of varying level of robustness.¹

The group were advised that Hadlock, Chitty, ASUM and Intergrowth (IG21) charts were potentially favoured choices and conducted an audit of third trimester scans to establish which of these were a 'best fit'.

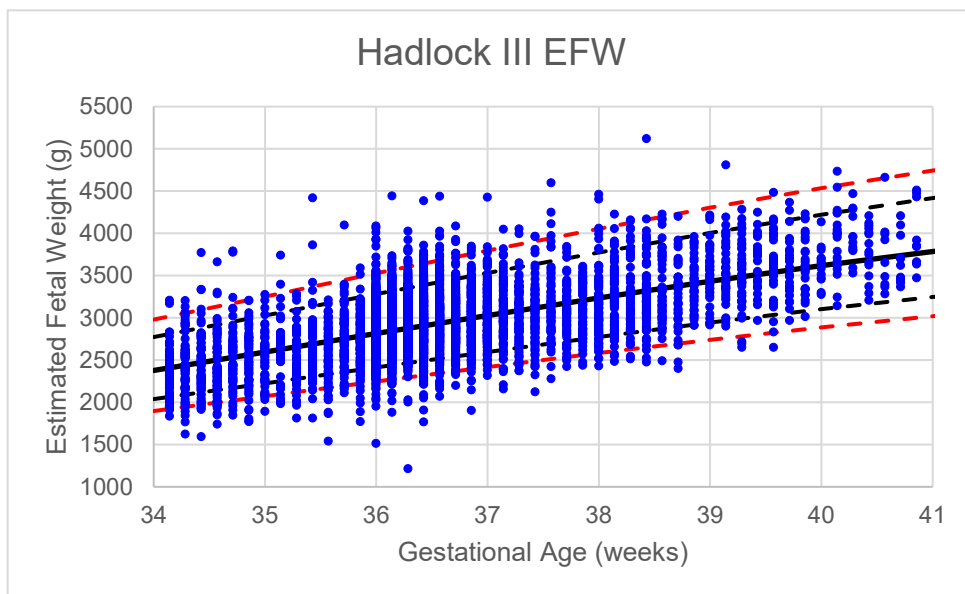
The audit involved reviewing a dataset of (n= 6,419) third trimester scans (34-42 weeks' gestation) completed between July 2018 and June 2019. Biometry (HC, AC and FL) were plotted on a series of Hadlock, Chitty, ASUM and Intergrowth (IG21) charts for visual review and a subset of the data (n = 3,745) (involving women who attended for a routine rather than a clinically indicated scan at 35⁺⁵ to 37⁺² weeks) was evaluated to determine what proportion of pregnancies lay outside 3rd, 10th, 90th and 97th centile issues (Table 1). This process demonstrated that ASUM HC and AC and Chitty FL charts appeared to be the best fit for our population.

Table 1: Proportion of routine scan cases (35⁺⁵ - 37⁺² weeks) falling below or above fixed centiles.

Chart	Reference centile	HC	AC	FL
Hadlock	Proportion < 3 rd	6.38%	2.69%	5.47%
	Proportion <10 th	18.18%	6.61%	19.20%
	Proportion >90 th	7.37%	27.56%	1.71%
	Proportion >97 th	2.78%	14.76%	0.27%
Chitty	Proportion < 3 rd	2.54%	0.19%	0.88%
	Proportion <10 th	11.19%	0.68%	4.38%
	Proportion >90 th	3.74%	35.42%	6.49%
	Proportion >97 th	1.07%	13.84%	1.15%
ASUM	Proportion < 3 rd	0.51%	1.85%	5.93%
	Proportion <10 th	2.96%	6.12%	18.96%
	Proportion >90 th	11.72%	8.10%	2.80%
	Proportion >97 th	3.18%	2.09%	0.61%
IG21	Proportion < 3 rd	1.31%	0.52%	0.45%
	Proportion <10 th	5.45%	1.63%	1.31%
	Proportion >90 th	13.30%	24.30%	26.06%
	Proportion >97 th	4.49%	8.53%	10.04%

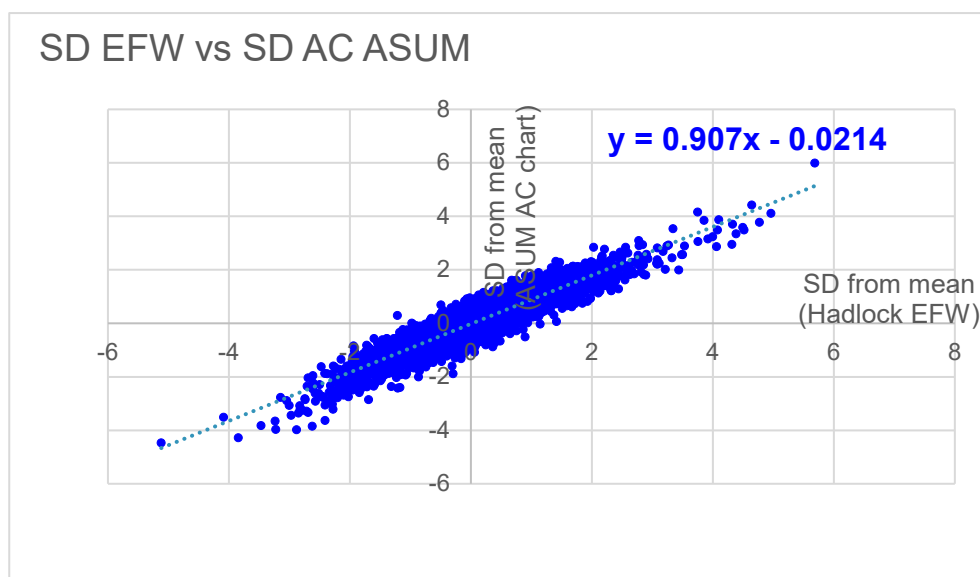
The estimated fetal weight measures for the cohort were plotted against the Hadlock III chart and showed good distribution (Figure 1).

Figure 1: RPA Cohort / Estimated Fetal Weight using Hadlock III chart:



Given that clinicians use either estimated fetal weight or abdominal circumference as a means of defining a cohort at risk of fetal growth restriction, the two normograms EFW (Hadlock) and AC (ASUM) were compared to check their concordance (Figure 2).

Figure 2: Comparison of Z scores using EFW (Hadlock) and AC (ASUM) charts:



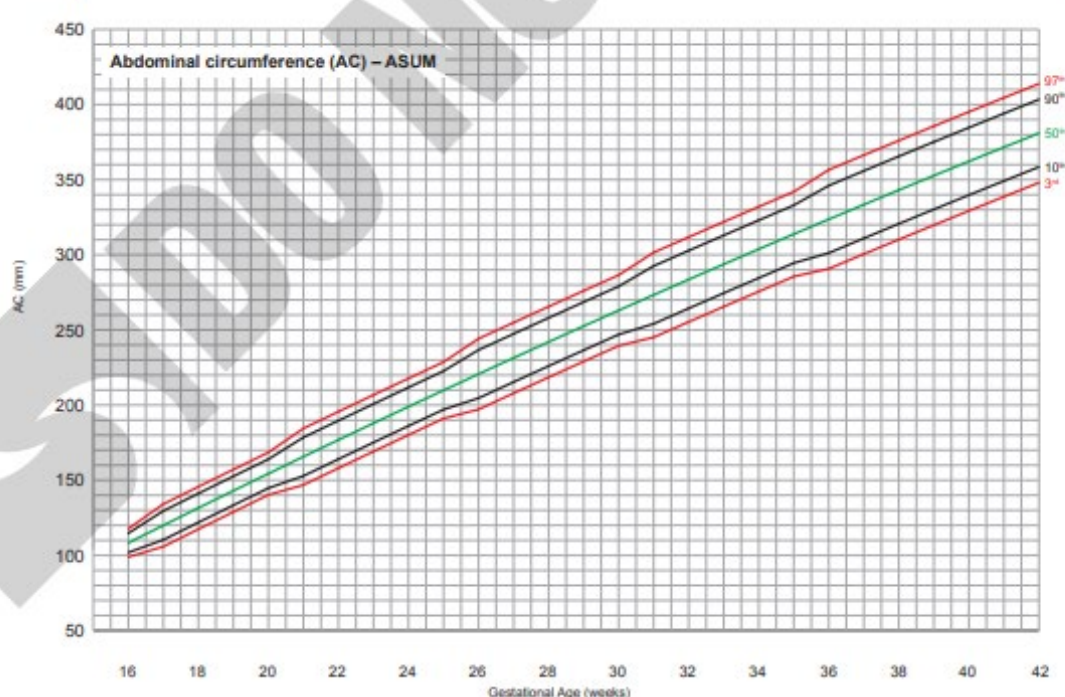
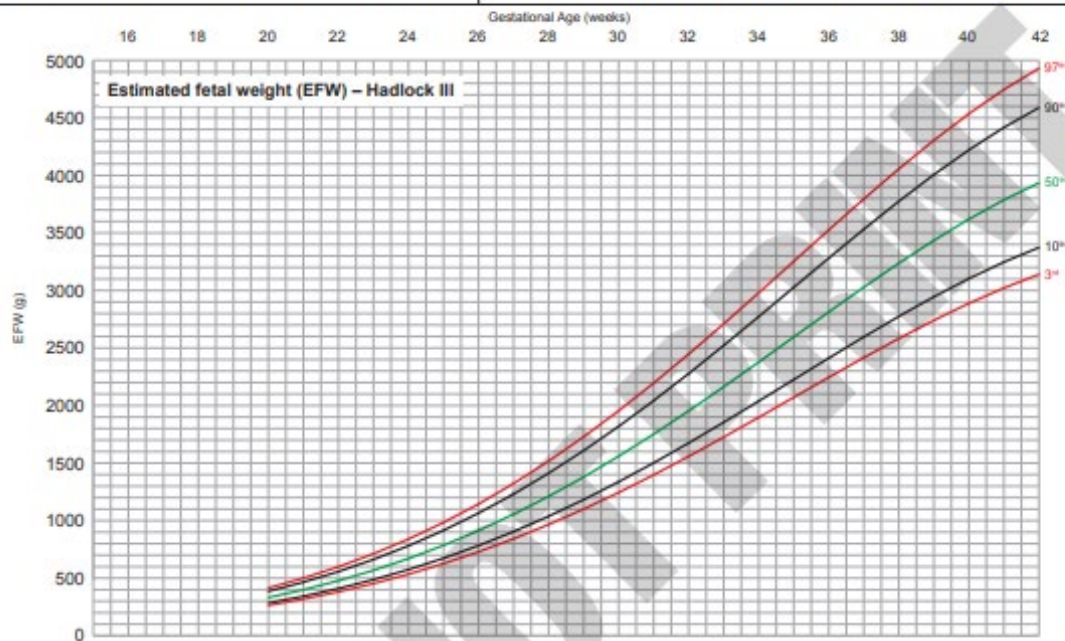
Appendix 3: NSW Health Fetal Biometry Growth Scan Charts



SMR110555

Holes Punched as per AS2828.1: 2019
BINDING MARGIN - NO WRITING

	FAMILY NAME		MRN
	GIVEN NAME		<input type="checkbox"/> MALE <input type="checkbox"/> FEMALE
Facility: Maternity - Fetal Biometry Ultrasound Growth Scan Charts	D.O.B. ____/____/____		M.O.
	ADDRESS		
	LOCATION / WARD		
COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE			



Percentile — 50th — 3rd — 10th — 90th — 97th

Data from widely available sources including ASUM.

FETAL GROWTH CHARTS

SMR110.555

NO WRITING

Page 1 of 2



Health

FAMILY NAME

MRN

GIVEN NAME

MALE

FEMALE

Facility:

D.O.B. ____/____/____

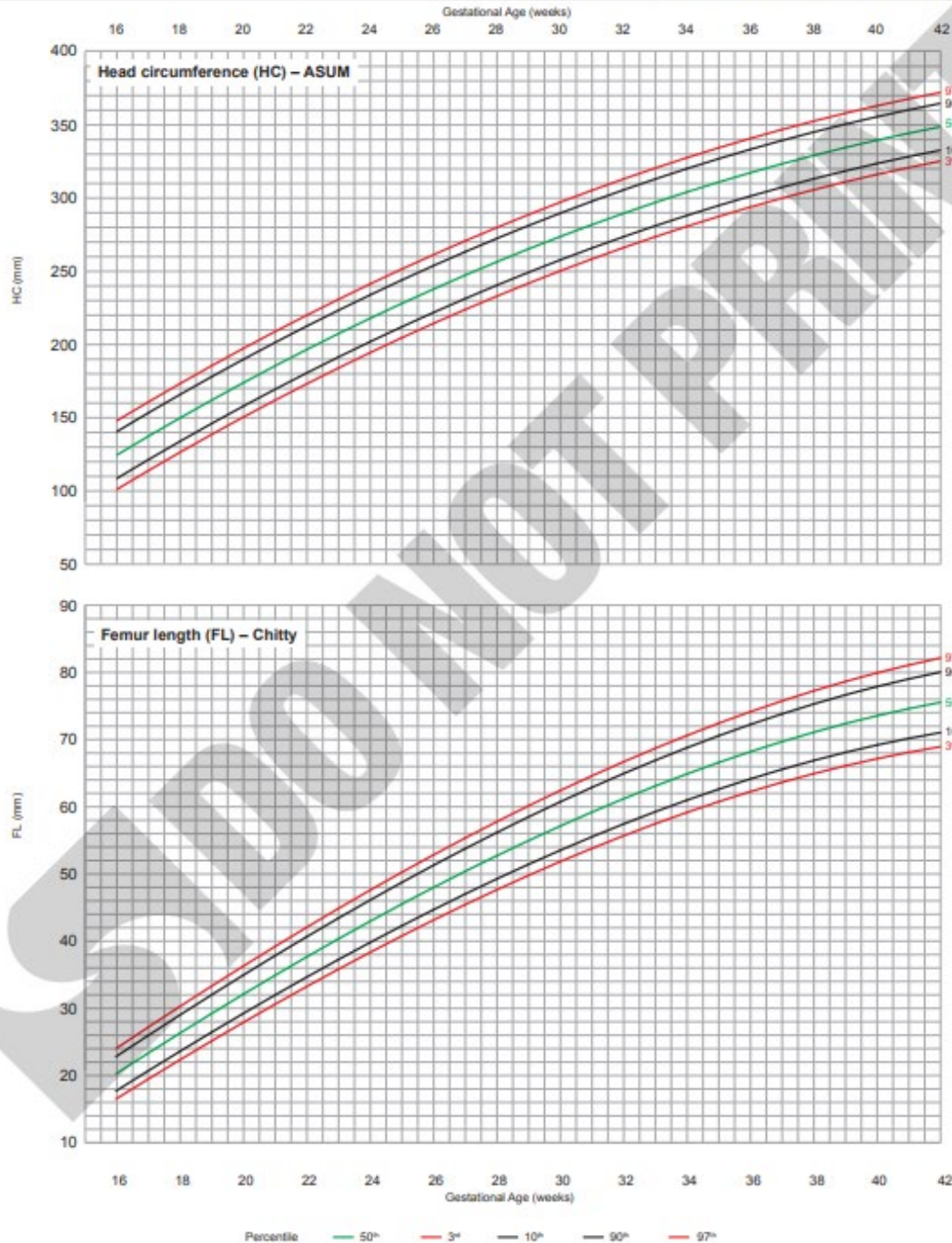
M.O.

ADDRESS

Maternity - Fetal Biometry Ultrasound Growth Scan Charts

LOCATION / WARD

COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE



Holes Punched as per AS2828-1:2019
BINDING MARGIN - NO WRITING

SMR 110555



References

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2. International Society of Ultrasound in Obstetrics and Gynecology. ISUOG Practice Guideline: Ultrasound assessment of fetal biometry and growth. *Ultrasound Obstet Gynecol* 2019; 53: 715-723.
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4. Westerway SC. Ultrasonic fetal measurements: New Australian standards for the new millennium. *Aust N Z J Obstet Gynaecol* 2000; 40: 297-302.
5. Chitty LS, Altman DG, Henderson A, Campbell S. Charts of fetal size: 4. Femur length. *BJOG* 1994; 101: 132-135.
6. Hadlock FP, Deter RL, Harrist RB, Park SK. Estimating fetal age: Computer assisted analysis of multiple fetal growth parameters. *Radiology* 1984; 152: 497-501.
7. NSW Health Clinical Excellence Commission (CEC). The Safer Baby Bundle. Element 2: Improving Detection and Management of fetal growth Restriction. Available on the NSW Health CEC website.