Developing the Fit 4 Labour tool

A computer-based data-driven
screening test at the onset of labour
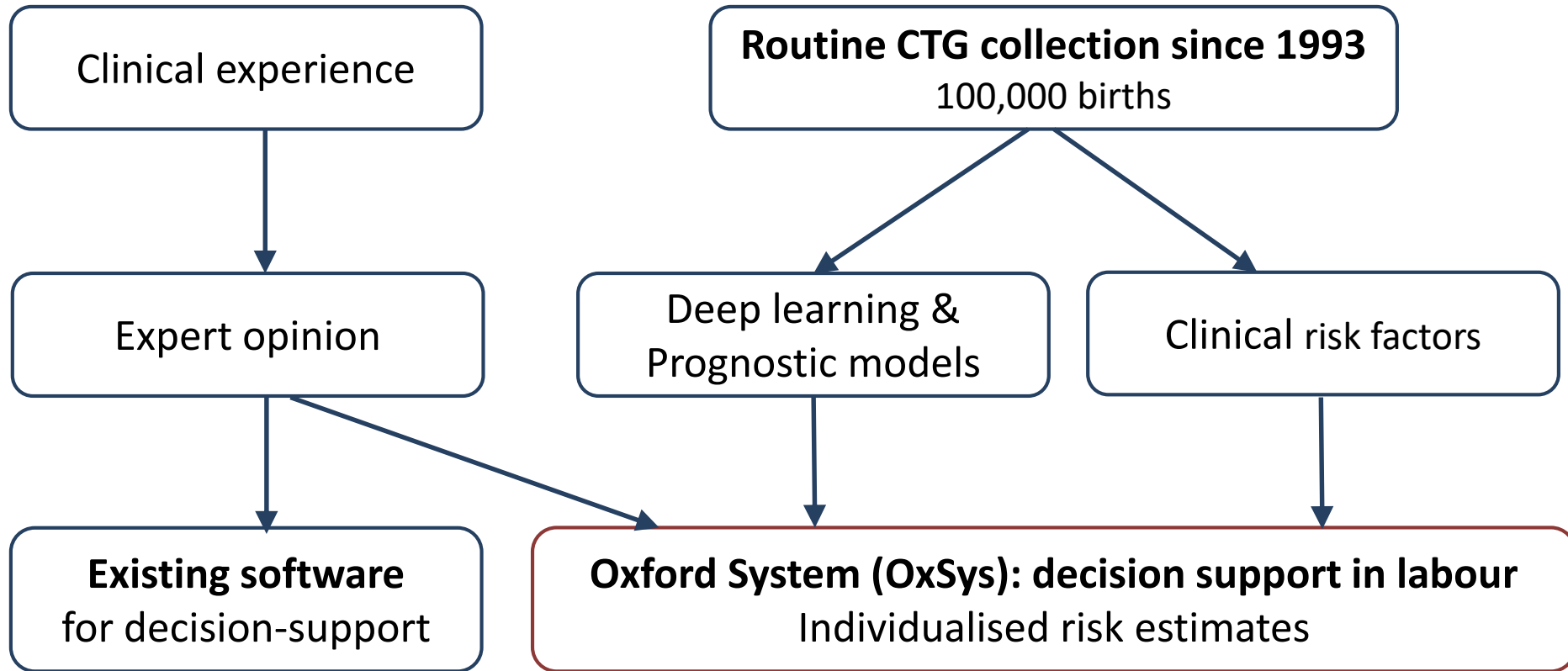
Antoniya Georgieva

Associate Professor
Principal Investigator, Oxford Labour Monitoring

Oxford Labour Monitoring

Mission: prevent injury of babies during labour and delivery, caused by lack of oxygen in utero

Clinical experience

Routine CTG collection since 1993
100,000 births

Expert opinion

Deep learning & Prognostic models

Clinical risk factors

Existing software
for decision-support

Oxford System (OxSys): decision support in labour
Individualised risk estimates

Routinely collected maternity data: ~ 100,000 births at term

Year 1993
All CTG traces as per clinical practice at 4Hz (about 60% of births, billions of data points)
Maternal: age, BMI, hypertension, diabetes;
Pregnancy: pre-eclampsia, cholestasis, gestational age;
Labour: delivery method, analgesia, oxytocin, APGAR, arterial-venous cord gases as obtained per clinical practice; thick meconium, maternal fever, obstetric emergencies;
Neonatal: seizures, resuscitation, neurological disturbances, time in neonatal intensive care, birth weight; and others.

Year 2000
Additional: ethnicity, reason for operative delivery, refined ICD10 codes for mother and baby (as required by the national statistics office and reported by NHS digital)

Year 2012
The HIE Risk (HIER) database with comprehensive details for all babies diagnosed with moderate/severe HIE or receiving hypothermia treatment: EEG reports, neonatal MRI scans, reviewed by a specialist blinded to other clinical data, 2-year follow up, and many more details.

Year 2016
Outputs from a routine 36-week ultrasound scan: detailed biometrics, for example placental/cerebral ratio.

Time-series signal processing

Clinical risk factors & expertise

Statistical Prediction Models

Maternity databases

Data-driven clinical decision-support in labour

Deep Learning & AI

Biomarkers

Animal experimental data

Software as a medical device

External validation

Usability / Trust

Commercialisation

Large-scale RCTs

Clinical and societal impact

Team

https://www.wrh.ox.ac.uk/research/oxfordlabourmonitoringgroup

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Associate Professor, Group Lead - Oxford Labour Monitoring

Pawel Szafranski
Data Manager

Charlotte Bevan
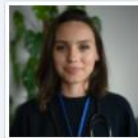Parent, Patient and Public Involvement (PPPI) Co-Lead

Rachel Plachcinski
Parent, Patient and Public Involvement (PPPI) Co-Lead

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Post-doctoral scientist, AI and Deep Learning for intrapartum CTG

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NHS Oxford University Hospitals NHS Foundation Trust

NHS St George's University Hospitals NHS Foundation Trust

NHS Cambridge University Hospitals NHS Foundation Trust

NHS Birmingham Women's and Children's NHS Foundation Trust

LIETUVOS SVEIKATOS MOKSLŲ UNIVERSITETO LIGONINĖ KAUNO KLINIKOS

THE UNIVERSITY OF AUCKLAND To Whare Wananga o Tamaki Makaurau NEW ZEALAND

UNIVERSITAS OSLOENSIS MDCCCXI

Cardiotocography and Clinical Risk Factors in Early Term Labor: A Retrospective Cohort Study Using Computerized Analysis With Oxford System

Aimée A K Lovers [1], Austin Ugwumadu [2], Antoniya Georgieva [1]

Affiliations + expand

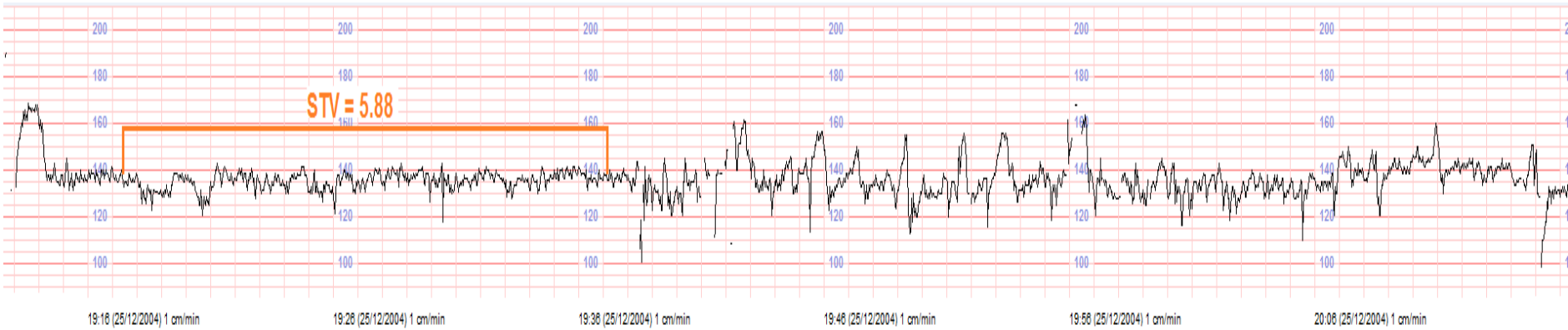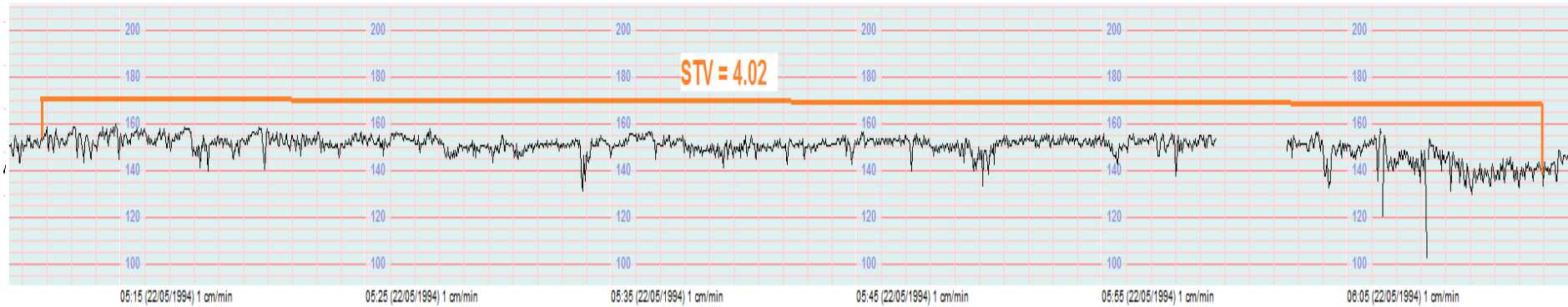**In their first hour CTG, babies with severe compromise had significantly higher % of cases with:**
- baseline fetal heart rate ≥150 bpm;
- non-reactive trace;
- reduced long-term and short-term variability;
- decelerative capacity;
- no accelerations;
- Prolonged decelerations(≥3 min)

Clinically:
- thick meconium;
- small for gestational age;
- thick meconium, maternal fever ≥38 C, sentinel events, and other clinical risk factors were more commonly picked up with *Emergency CS* within 2hrs of starting admission trace.
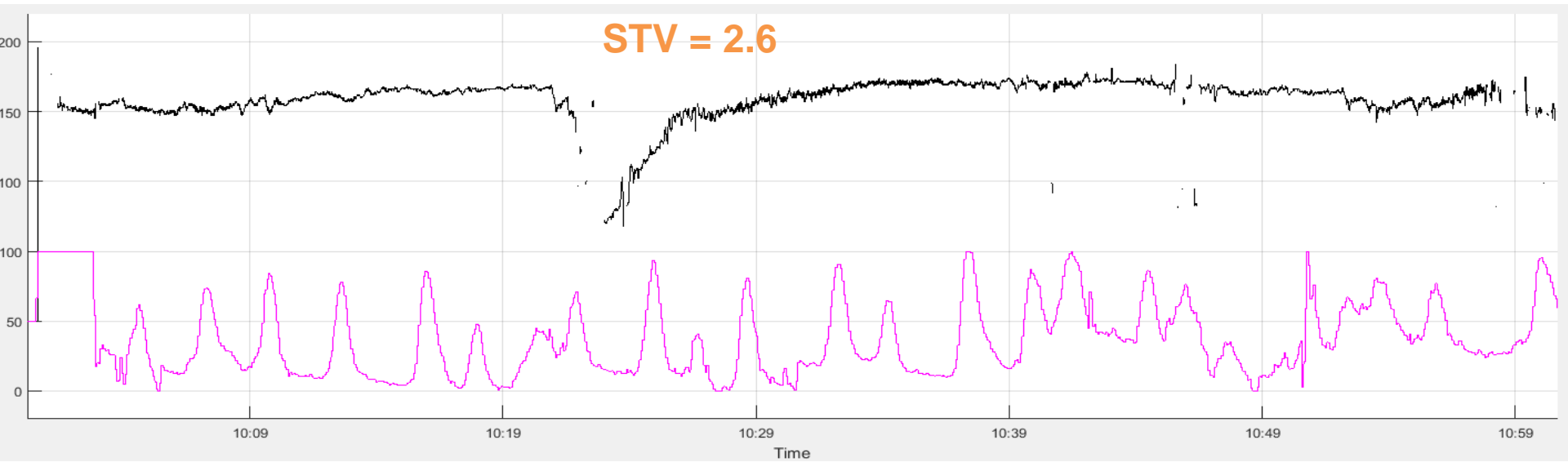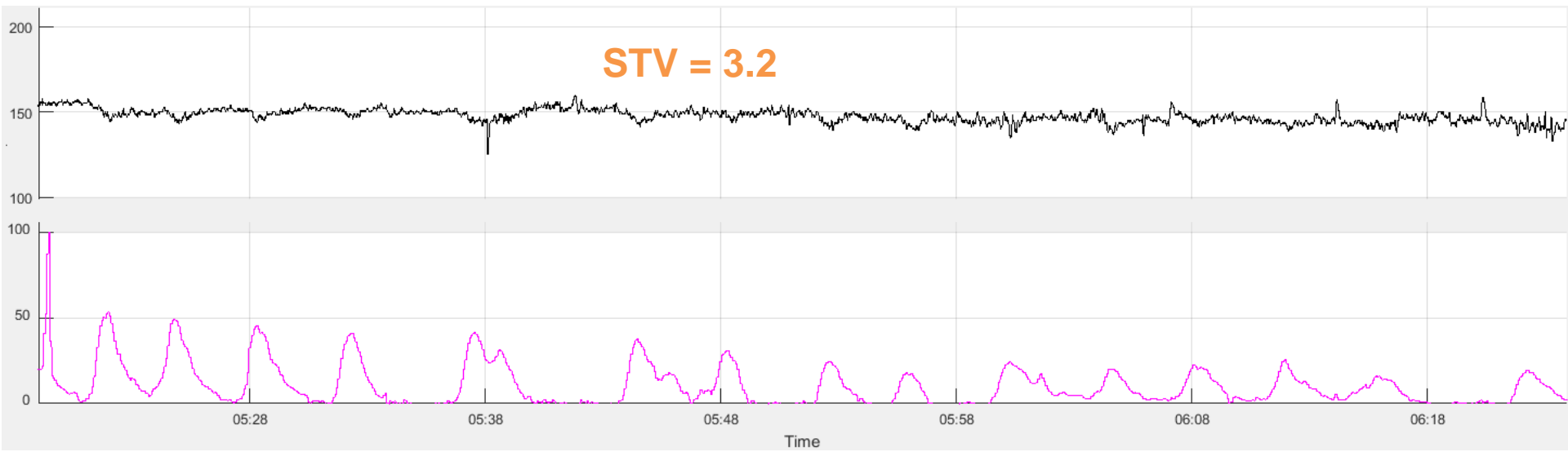
STV = 5.88

19:16 (25/12/2004) 1 cm/min   19:26 (25/12/2004) 1 cm/min   19:36 (25/12/2004) 1 cm/min   19:46 (25/12/2004) 1 cm/min   19:56 (25/12/2004) 1 cm/min   20:06 (25/12/2004) 1 cm/min

(a) Reactive

STV = 4.02

05:15 (22/05/1994) 1 cm/min   05:25 (22/05/1994) 1 cm/min   05:35 (22/05/1994) 1 cm/min   05:45 (22/05/1994) 1 cm/min   05:55 (22/05/1994) 1 cm/min   06:05 (22/05/1994) 1 cm/min

(b) Nonreactive

One-hour long traces. STV = Short Term Variability.

STV = 3.2

STV = 2.6

A Clinical Study to introduce a Fetal Monitoring Decision-Support Tool
(*Fit for Labour*)

Mariana Tome
Clinical Research Fellow

THE FIT FOR LABOUR TEST
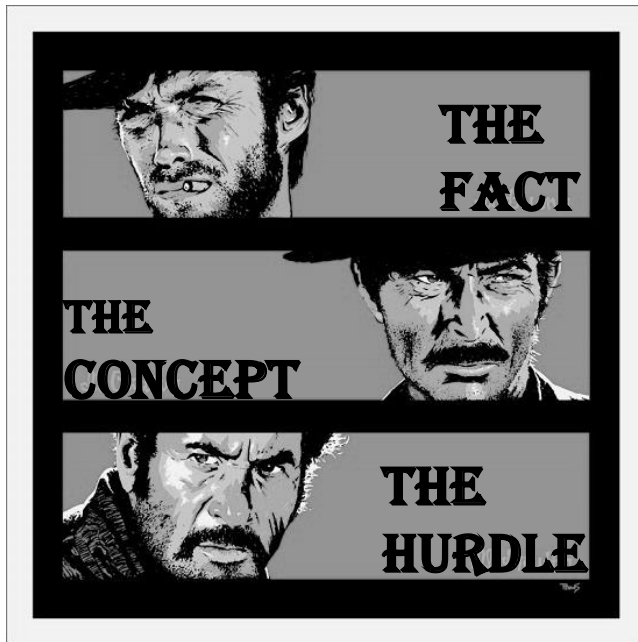
Labour is a time of intermittent oxygen deprivation. This is normal.

Identify babies at the onset of labour with pre-existing injury OR struggling with early labour.

CTGs are **complex and difficult** to interpret plus affected by **multiple risk factors.**

THE FIT FOR LABOUR TOOL

THE CONCEPT: screening test to Identify babies with pre-existing injury OR struggling with early labour.

- Data statistical prognostic model
- Risk factors
- Computerised CTG

AIM: Is to help all midwives & clinicians manage those *at-risk* appropriately.

= DECISION-SUPPORT SOFTWARE

THE FIT FOR LABOUR TOOL

CTG at the onset of labour

Fit For Labour Test
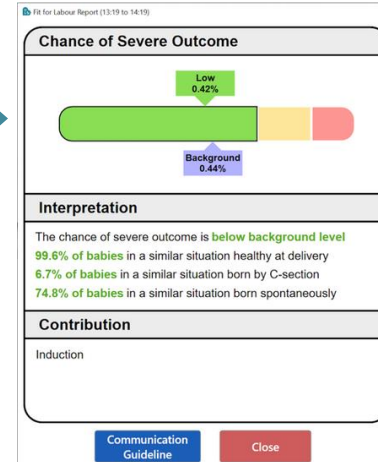
Individualised
Risk Score
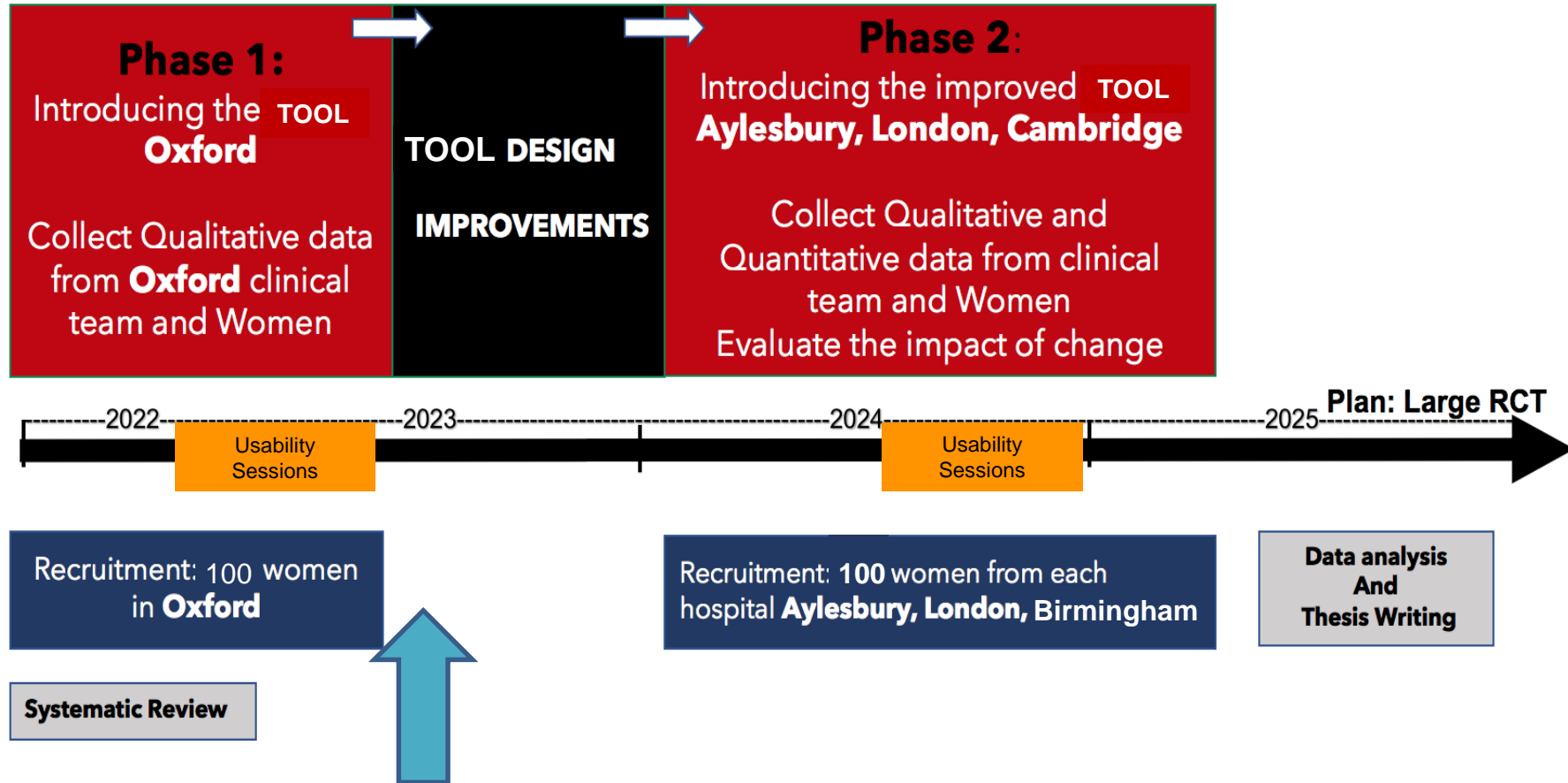
Study Title: Technology Evaluation & 'proof-of-concept' study.

1. <u>Assess the feasibility and usability</u> in real-time clinical setting.

2. <u>Assess the ease of recruitment.</u>

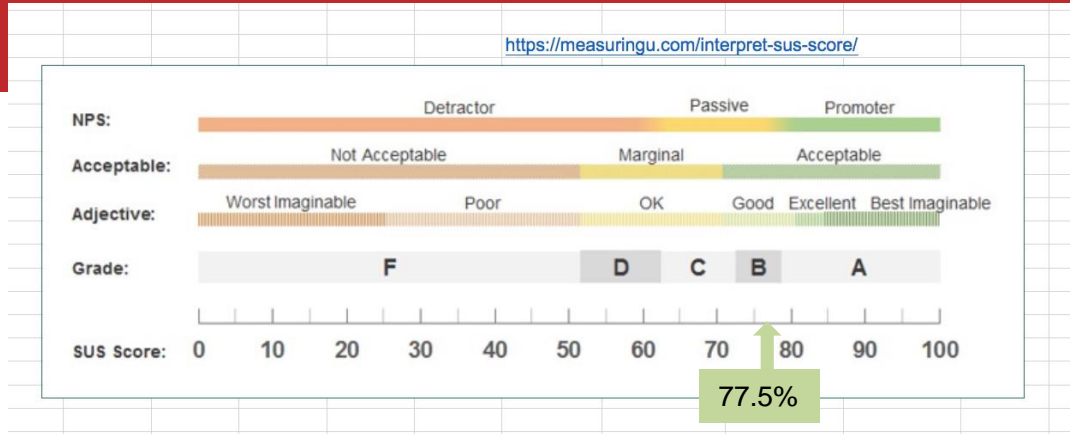3. <u>Co-design and improve the tool</u> to plan a future large RCT.

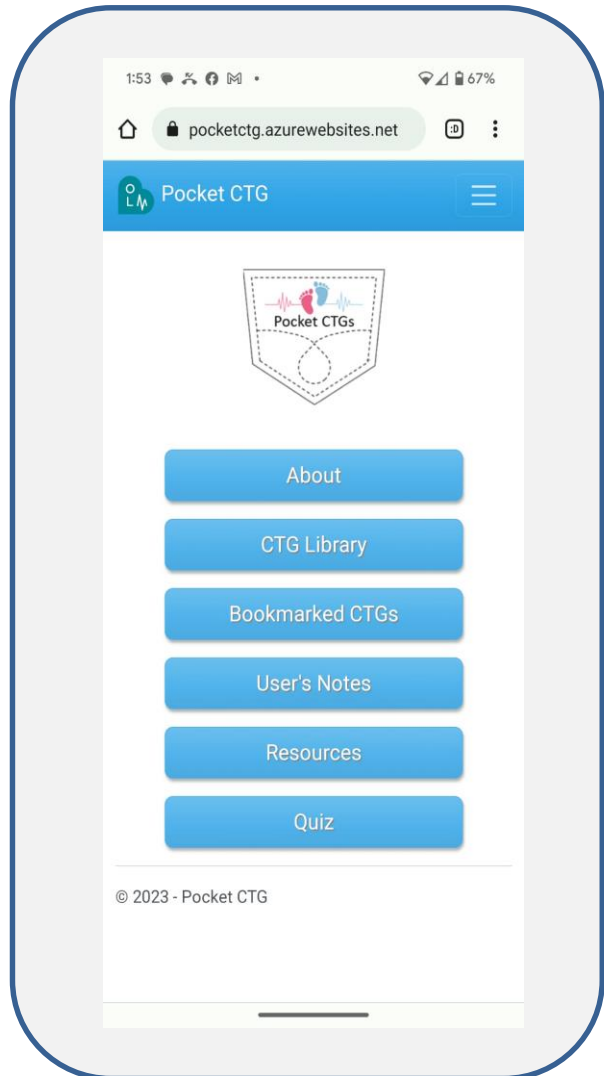**AYLESBURY**

OXFORD

LONDON

BURMINGHAM

THE FIT FOR LABOUR TOOL

Phase 1:
Introducing the TOOL **Oxford**

Collect Qualitative data from **Oxford** clinical team and Women

TOOL DESIGN IMPROVEMENTS

Phase 2:
Introducing the improved TOOL **Aylesbury, London, Cambridge**

Collect Qualitative and Quantitative data from clinical team and Women
Evaluate the impact of change

2022 — 2023 — 2024 — 2025

Plan: Large RCT

Usability Sessions

Usability Sessions

Recruitment: 100 women in **Oxford**

Recruitment: **100** women from each hospital **Aylesbury, London,** Birmingham

Data analysis And Thesis Writing

Systematic Review

THE FIT FOR LABOUR TOOL
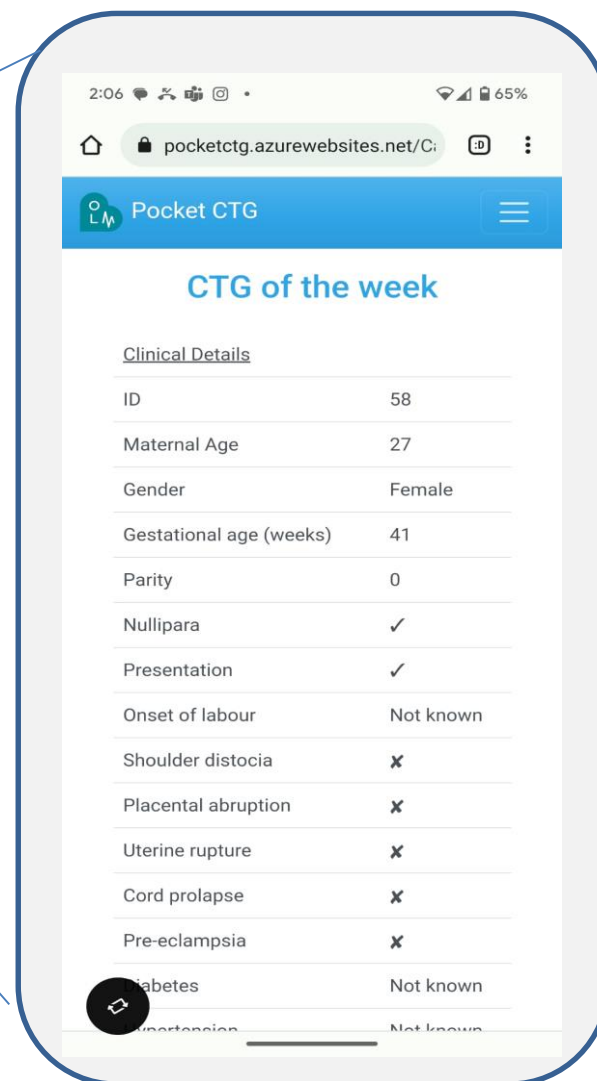
USABILITY SESSIONS
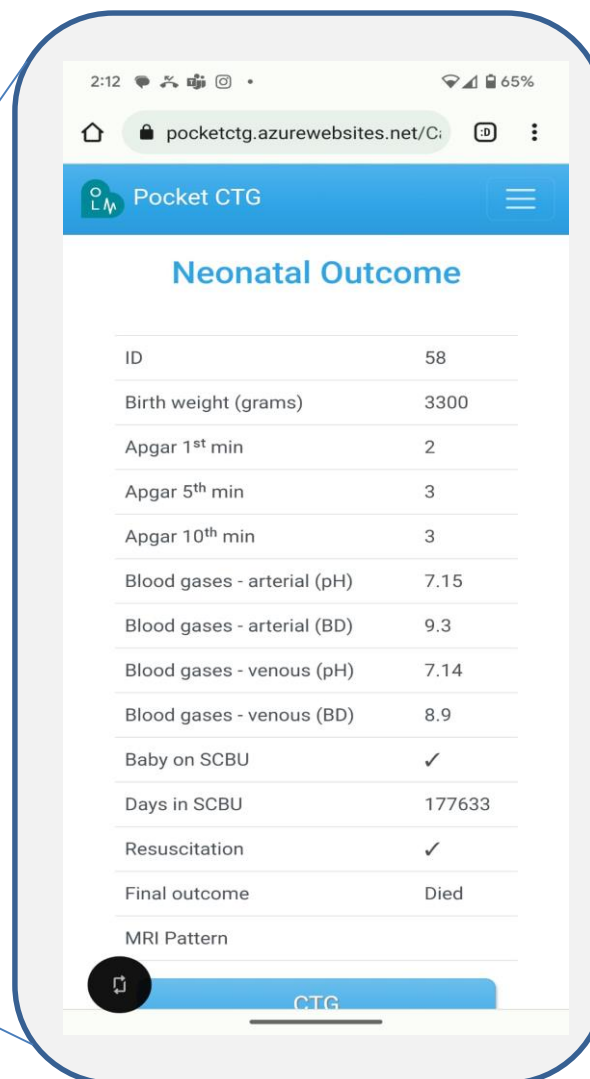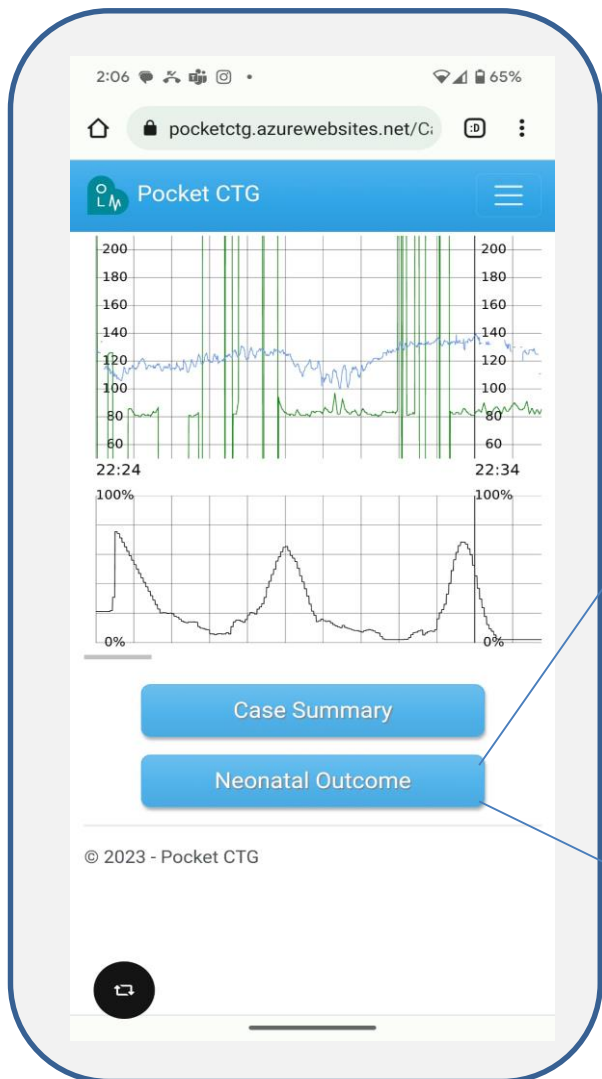
THE POCKET CTG

Mobile Learning/Training App

- A novel training tool for on-the-go CTG interpretation learning.

- Adjunct to current fetal monitoring training.

- A library of CTGs and cases with neonatal outcomes (easily hundreds of cases

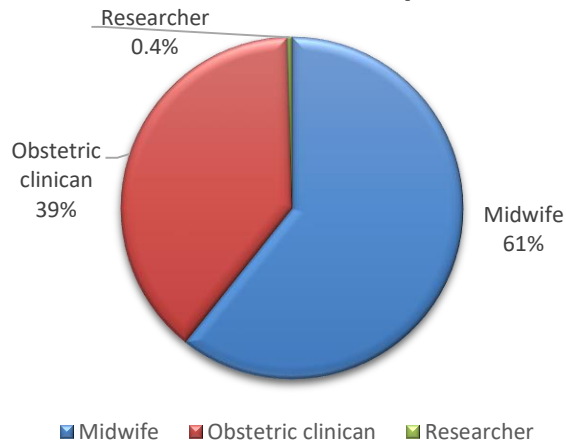- Easily accessible to users

THE POCKET CTG

THE POCKET CTG

THE POCKET CTG

Pocket CTG survey results:

252 responses to a questionnaire online Autumn 2021

Professional role of respondent

Researcher 0.4%

Obstetric clinican 39%

Midwife 61%

- ■ Midwife ■ Obstetric clinican ■ Researcher

CTGs can be challenging to interpret

- Strongly agree
- Agree
- Neither disagree/agree
- Disagree
- Strongly disagree

0 10 20 30 40 50 60 70
%
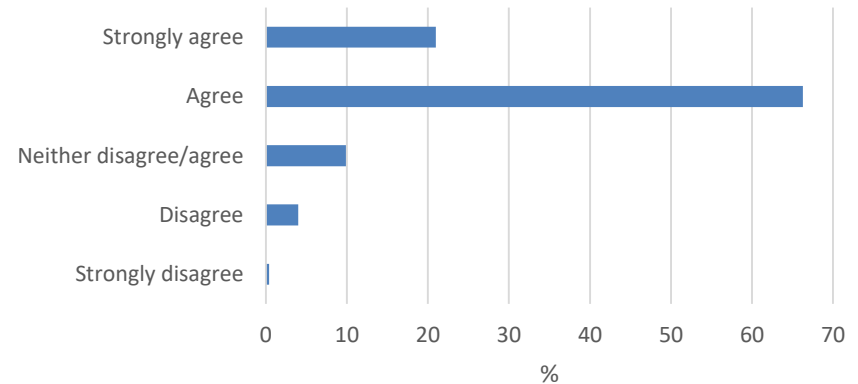
Differing guidance leads to confusion when interpretting CTG traces
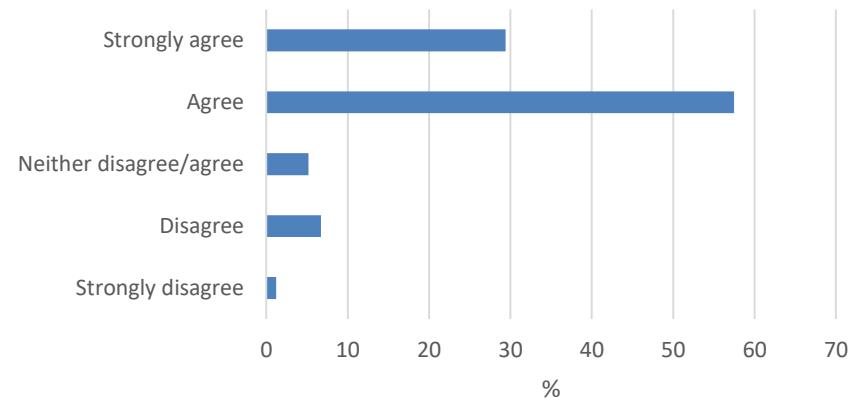
- Strongly agree
- Agree
- Neither disagree/agree
- Disagree
- Strongly disagree

0 10 20 30 40 50 60 70
%

THE POCKET CTG

Pocket CTG survey results:

252 responses to a questionnaire online Autumn 2021

METHODS OF FETAL MONITORING TRAINING
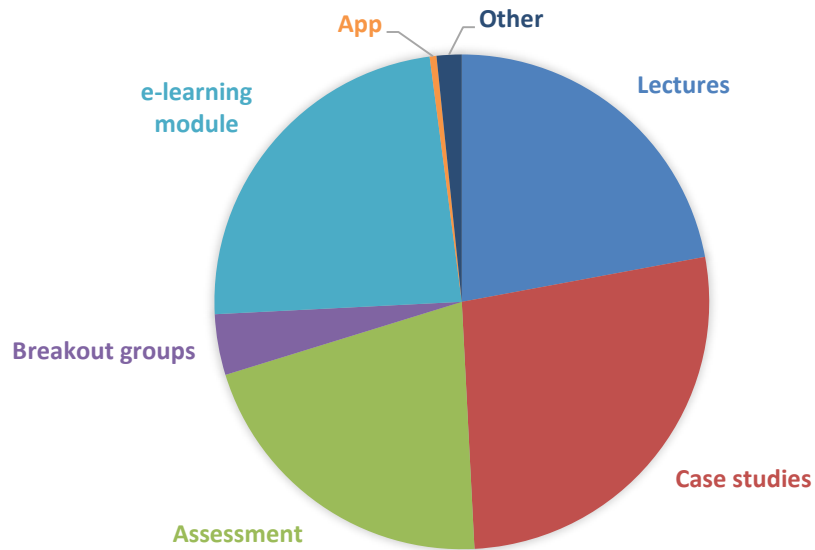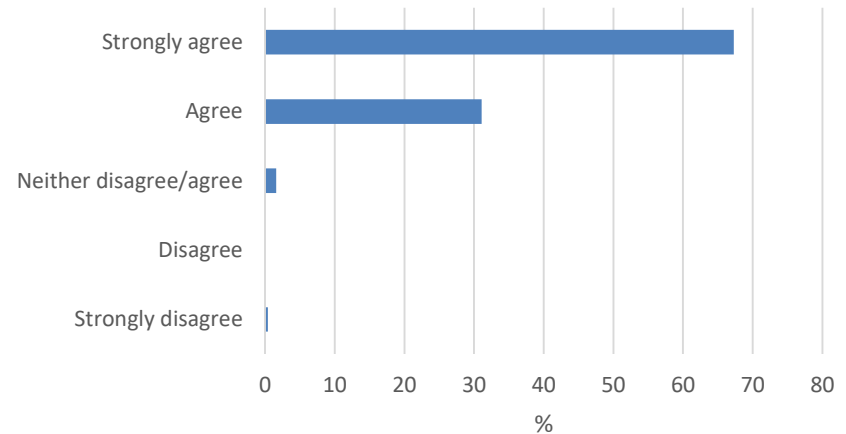

Pie chart labels: App, Other, e-learning module, Lectures, Breakout groups, Assessment, Case studies

Reviewing cases is useful as part of fetal monitoring training

Bar chart categories: Strongly agree, Agree, Neither disagree/agree, Disagree, Strongly disagree

X-axis: 0, 10, 20, 30, 40, 50, 60, 70, 80 — %

Thank you!

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