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## **Title Page**

# **Prediction of mode of delivery using the first “intrapartum app”**

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## CONDENSATION AND SHORT VERSION OF TITLE

**Short title:** “Intrapartum app”

**Condensation:** The “intrapartum app” allows prediction of the likelihood of vaginal delivery from ultrasound and digital examination in labor, based on a recently published model.

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Wassim Hassan...

## KEYWORDS

Application, transperineal, prediction model, head-perineum distance, Cesarean delivery



## **Manuscript**

**Objective:** The first labour prediction model was published in 2014 from a population of 120 women in 2 European maternity hospitals<sup>1</sup>. In 2017 based on this prediction model, the “intrapartum app” was launched (for research purposes only) on Apple and Android mobile devices<sup>2,3</sup>. We explore the applicability of this prediction model in app format in a different obstetric population.

**Study Design:** Nulliparous women at 37-42 weeks were recruited in early labour to a prospective study on intrapartum ultrasound and labour outcome, “The SONO-VE study”. Transabdominal ultrasound scans were used to assess fetal head position<sup>4</sup> and transperineal scan to assess fetal head station using head-perineum distance<sup>5</sup> and caput<sup>6</sup>. The cervical dilatation was recorded from the corresponding digital vaginal examination. Maternal and labour parameters including maternal age, BMI and presence or absence of prolonged labour were recorded on the app<sup>7</sup>. The original model defined vaginal delivery as 90-100% highly likely, 75-90% likely, 50-75% neutral, 25-50% unlikely, 0-25% highly unlikely. Kaplan Meier curves were constructed comparing the length of labour and likelihood of vaginal delivery within 3 simplified likelihood bands (“highly likely”, “likely and neutral” or “unlikely”). Data was anonymised and entered into an excel spreadsheet prospectively at the time of ultrasound and first digital vaginal examination. To prevent any potential for bias in clinical management, these data were entered by the research team at a time and place remote to the delivery suite into the app without knowledge of delivery outcome.

The study received UK Ethical approval from the Research Ethics Committee (REC) approval (Reference: 15/LO/0227) and local Joint Research Compliance Office approval (Ref: 14HH2428) for “The SONO-VE study”. The project was adopted by the NIHR portfolio (Ref: 163370).

**Results:** From April 2015- Jan 2018, the data from 270 women, of whom 1 withdrew consent, were consecutively entered into the “intrapartum app”. Of the remaining 269 patients, 79 patients had an emergency Caesarean section (29%). The length of labor was shorter for those patients predicted a high likelihood of vaginal delivery ( $\geq 75\%$ ) (Figure 1).

**Stats- TME..- length of time and proportion of vaginal deliveries in the 3 groups**

**Conclusion:** This first report of an “Intrapartum App” suggests that it predicts vaginal delivery in a different obstetric population from that in which the model was developed. The acceptability and accuracy of this model can now be tested in prospective study.

## FIGURE OR TABLE

### **Figure 1:**

**A:** “Intrapartum App” results page showing the prediction of the likelihood of Vaginal birth weblink

**B:** Kaplan Meier curves: comparing the length of labour and likelihood of vaginal delivery as per the app. Group 1: 90-100%=highly likely, group 2: 75-90%=likely, group 3 <75%=Neutral to Unlikely.

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**Author’s contribution:** Sana Usman was responsible for writing and submitting the manuscript. Christoph Lees, Sana Usman, Helen Barton and Charlotte Wilhelm-Benartzi designed the study, the “Intrapartum App” and recruited the patients. Christoph Lees, Sana Usman, Wassim Hassan, Charlotte Wilhelm-Benartzi, Torbjorn Eggebo, Birgitte Kahrs and Kjell Salvesen were involved in developing the original labour prediction model. All authors contributed to the analysis, writing and review of the manuscript.



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