

HeartLight: An Engineering and Clinical partnership for improving newborn resuscitation

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The University of
Nottingham

UNITED KINGDOM • CHINA • MALAYSIA



Nottingham University Hospitals 
NHS Trust

Antenatal fetal heart rate monitoring



The screenshot shows the Monica Healthcare website. At the top left is the Monica Healthcare logo. The navigation menu includes Home, Products, Who We Are, Why Monica, News, Sales Channels, Investors, Contact, and Shop. A 'Support and Login' link is in the top right. The main banner features a pregnant woman with fetal monitoring sensors on her abdomen, connected to a GE Healthcare fetal monitor. The monitor's screen displays fetal heart rate (126 bpm) and uterine activity (10 mV). The text on the banner reads: 'GE Healthcare are Monica's exclusive distribution Partner in North America' and 'Together Improving fetal monitoring'. A 'Read More' button is below the text. Below the banner is a row of five dots, with the first one filled. The content area below is divided into three sections: 1. 'New Monica Novii Fetal Monitor available from GE Healthcare' with a sub-image of the monitor on a pregnant woman's abdomen and a 'Read more' button. 2. 'Philips Collaboration' with a sub-image of a woman holding a baby and a 'Read more' button. 3. A video player showing a woman with the Novii monitor on her abdomen being attended to by a healthcare professional, with a 'Read more' button below it.

Support and Login

Home Products Who We Are Why Monica News Sales Channels Investors Contact Shop

Monica healthcare

GE Healthcare are Monica's exclusive distribution Partner in North America

Together Improving fetal monitoring

[Read More](#)

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New Monica Novii Fetal Monitor available from GE Healthcare

The Novii Wireless Patch System is Monica Healthcare's next generation fetal monitor, providing a smaller, more advanced and simpler solution for improving the birth experience for both the woman and those caring for her. GE Healthcare are now taking orders for the Novii Wireless Patch System and are Monica's exclusive Novii distributor in the USA.

[Read more](#)

Philips Collaboration

New exclusive co-development agreement to develop new advancements in mother and child care

[Read more](#)

See how Monica Novii is impacting the way that you monitor your toughest of patients

03:56 HD :: vimeo

“Detection of previously unrecognized daytime desaturation in children with chronic lung disease”

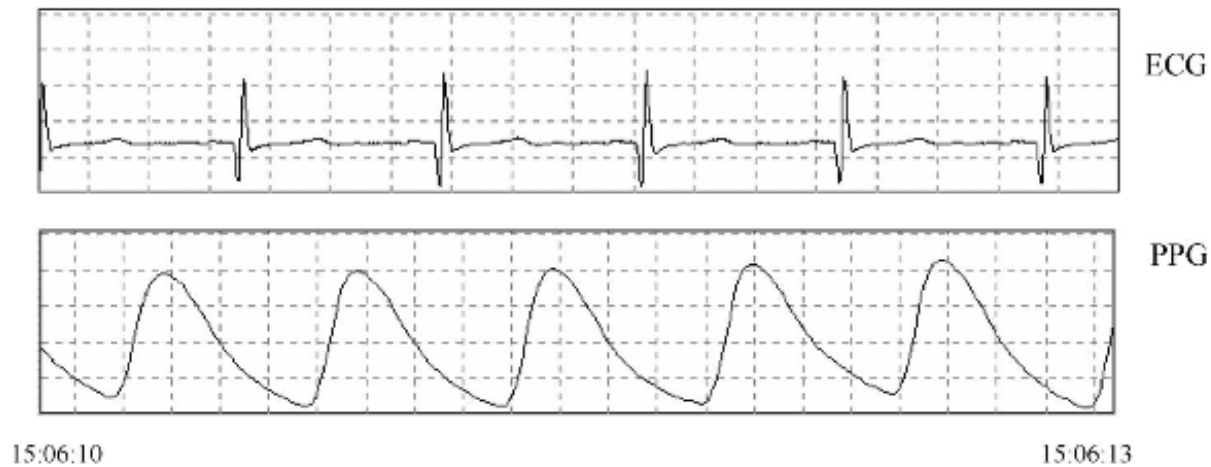
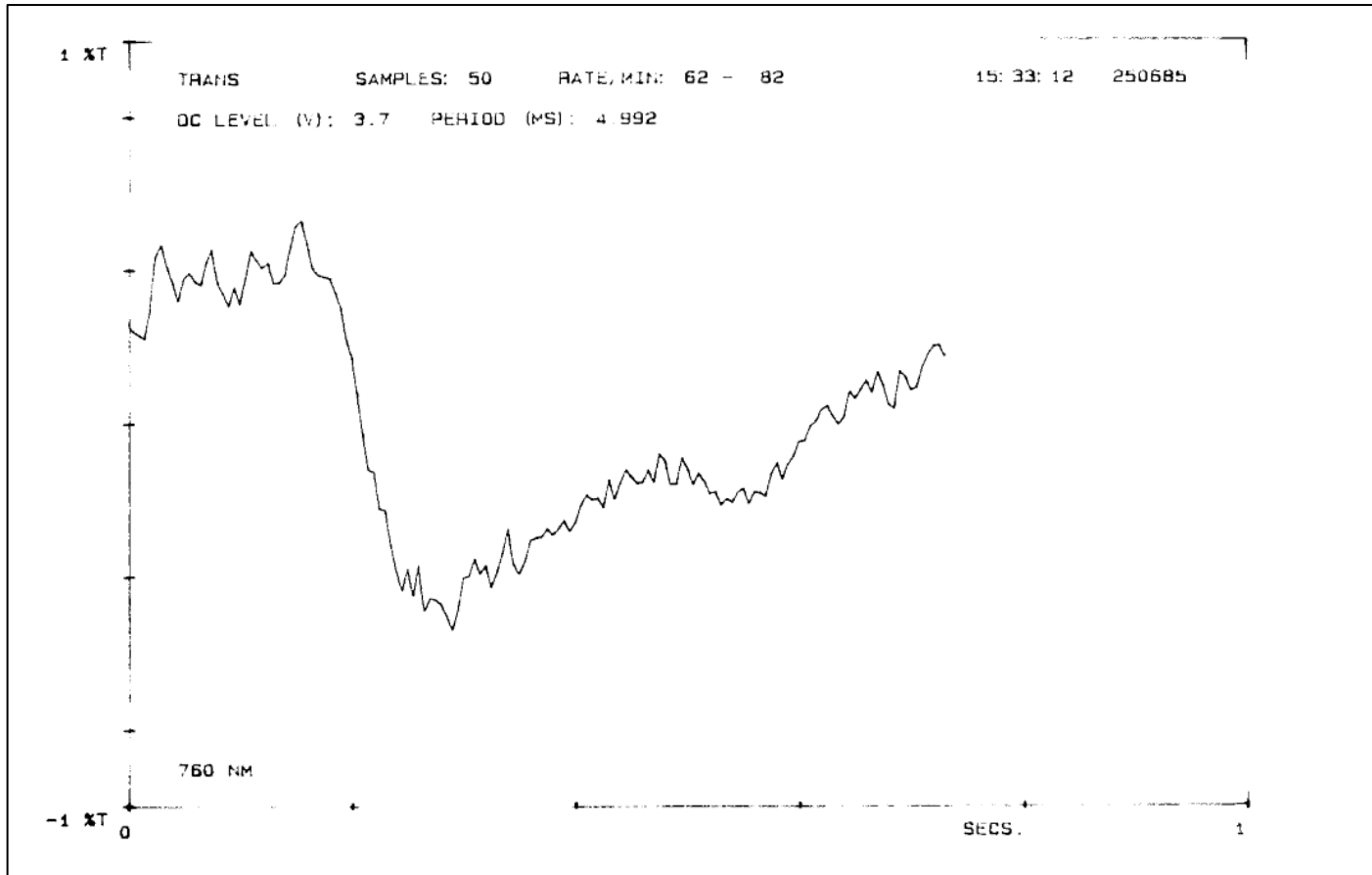
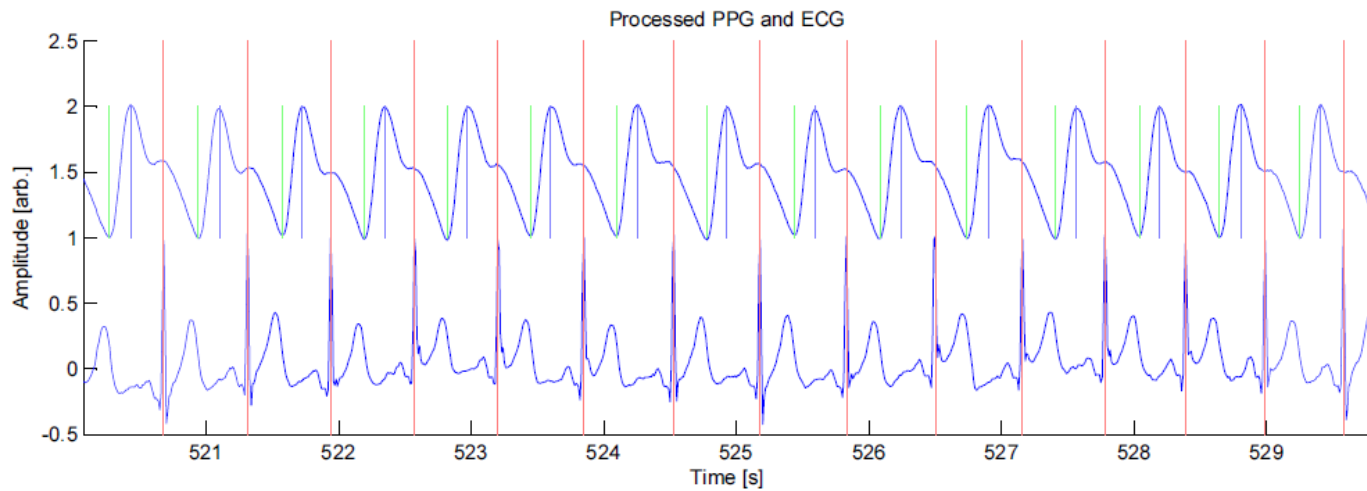
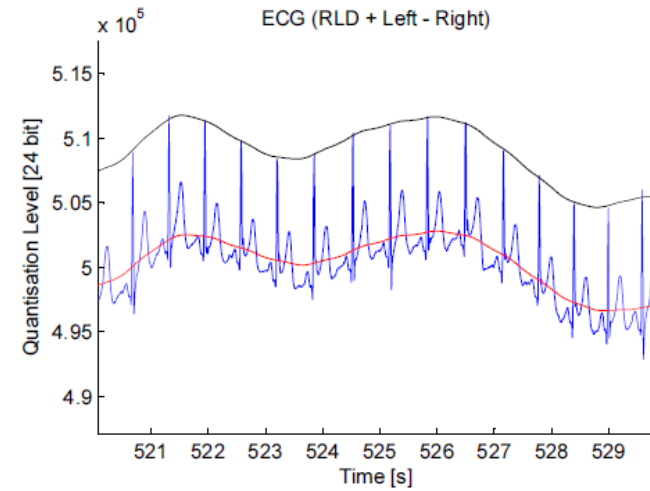
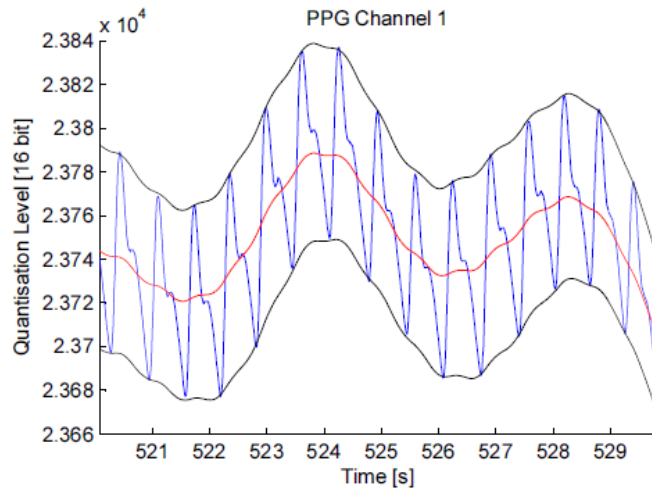


Figure 5. A three-second sample of the photoplethysmographic waveform and concurrent electrocardiogram during a period of desaturation with no evidence of motion artefact. SpO₂ = 91%; Pulse = 108 bpm; Ecg HR = 111 bpm; Temp = 24.1; Perfusion = High; TX error = valid.

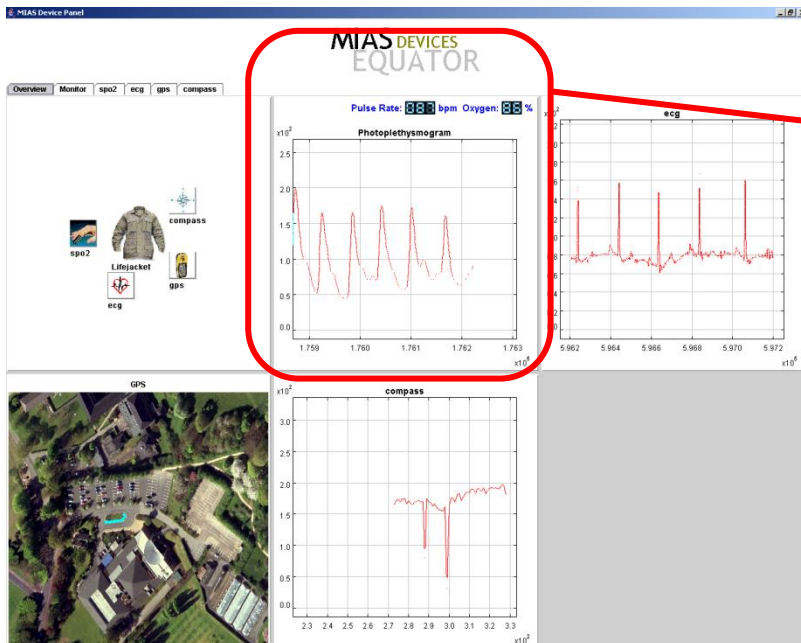




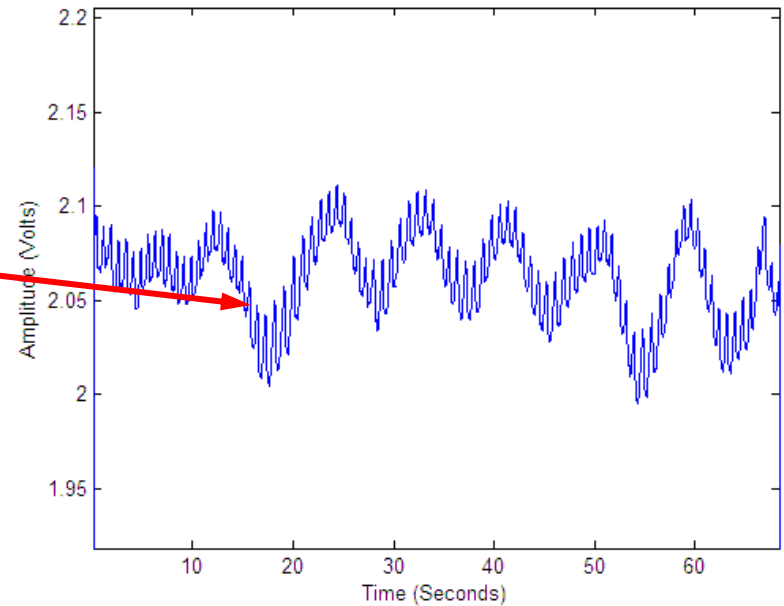
“Modular sensor architecture for unobtrusive routine clinical diagnosis”

PPG

ECG



510nm Forehead Plethysmogram



compass



Forehead sensor
(built into hard hat)

Heart rate
Breathing rate
Motion and fall alert
Skin temperature

Main board
(within battery pack)

Location
Ambient temperature and humidity
Emergency button and warning light
Data storage
Wireless communication

The Clinical Need

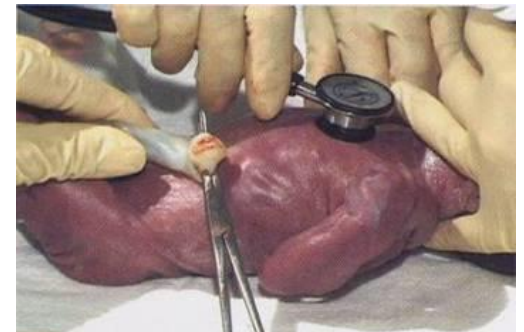
- 10% Newborns require resuscitation
 - Annual birth rate
 - UK 800,000 = 80,000
 - Global 135 million = 13.5 million
 - 140,000/year VLBW <1500g
preterm births (USA & Europe)



- Heart rate best indicator of success
 - Stethoscope currently used
 - Count for 10-15 seconds
 - Delays resuscitation
 - Calculation subject to errors (20-30%)
 - Non-continuous
- Other methods of assessment
 - Pulse oximetry – unreliable
 - ECG – technical and application issues

The “Golden Minutes”

- Babies resuscitated increased risk:
 - Death
 - Disability - deafness/blindness/cerebral palsy
 - Low IQ even if well after resuscitation (Lancet 2009)
- The longer the resuscitation the greater the risk



- Internal seminar - Engineering and Child Health



1st

- Action Medical Research
- ~120 babies recruited



2nd

- Clinical Research Network
- Extension ~20 babies



3rd

- MRC DPFS portfolio
- Further development and ~70 babies



CHT Centre for Healthcare Technologies





HeartLight

When reliability matters

Dr James Carpenter, CEO



- Joint Venture
 - University of Nottingham
 - Tioga Limited
- Intellectual property + commercial expertise

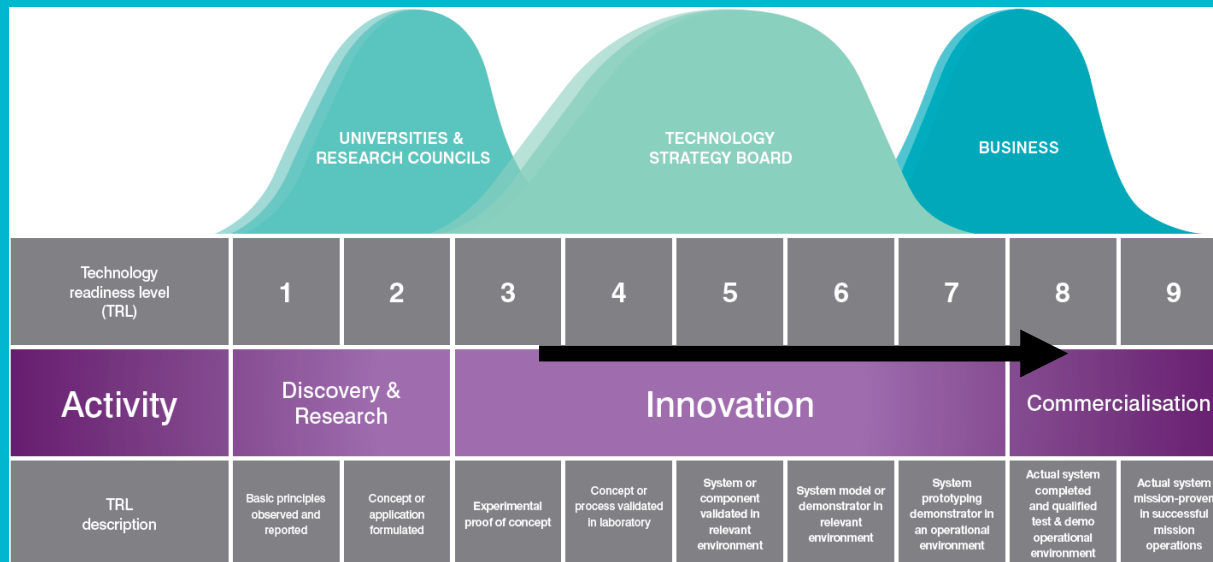
Commercialising HeartLight technology:
“better heart rate monitoring when it’s needed most”

The Opportunity for HeartLight

- 70-80,000 babies/yr (UK) need resuscitation, >13.5M/yr world wide
- Delivery rooms currently low tech compared to other resuscitative or intensive care environments
- Clinicians want better heart rate technology after birth
- HeartLight fits naturally into the existing care pathway
- Improving outcomes in the golden minutes after birth will save healthcare costs associated with ongoing short and long term care

Commercialisation

- £250k investment
 - JV partners & Angel investors
- £243k grant
 - part of £1.7M Innovate UK Biomedical Catalyst



Source: The NASA-developed Technology Readiness Level model¹⁷

£1.7M Biomedical Catalyst

- Heart Rate Monitor for Newborn Resuscitation
- Patient Trials on >100 babies
- Regulatory submissions (CE/FDA)



Clinical

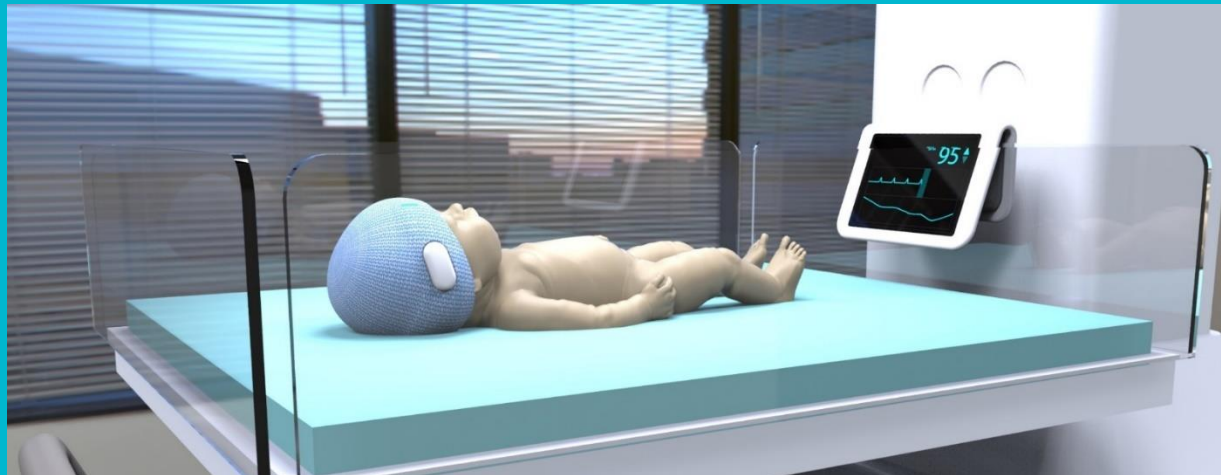
- Does it work?
- Does it improve outcomes?

Regulatory

- Electrical safety
- Usability
- Software
- Biocompatibility
- Risk based approach

Commercial

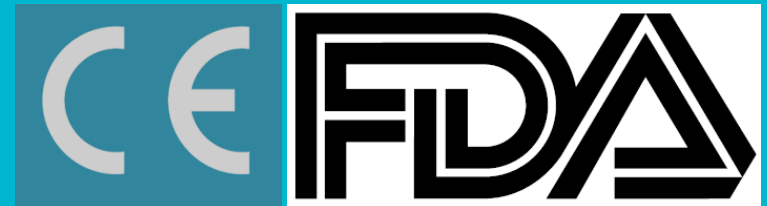
- Cost
- Manufacturability
- Market Viability



Intellectual Property

Status

- Prototype design produced
- NICU trials imminent
- Working towards
 - Delivery Room trials
 - Further fund raising
 - European & USA regulatory approvals
 - Convince someone to buy it!





HeartLight

When reliability matters

HeartLight Systems is a joint venture between the University of Nottingham and Tioga Ltd, an electronics manufacturer based in Derby

HeartLight technology has received over £2.5M of research funding since 2004

HeartLight Systems was set up in 2014 to commercialise the technology, initially for newborn babies requiring resuscitation at birth

Novel, automated, non-invasive perfusion device to identify sick children

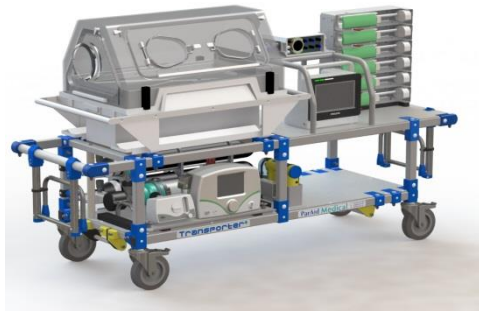


EPSRC
Engineering and Physical Sciences
Research Council

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MRC | Medical
Research
Council

Developing next generation neonatal transport system to improve outcomes



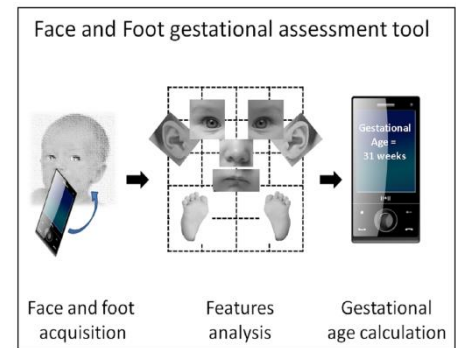
 Nottingham
Hospitals
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At the heart of your care

MRC | Medical
Research
Council

 **NHS**
National Institute for
Health Research

ParAid
Medical

Software algorithm to estimate newborn gestational age using an App



BILL & MELINDA
GATES foundation

Thank you



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