NorthFutures
Northern Health Futures Hub

UKRI Engineering and Physical Sciences Research Council

Public Showcase

15:30 | USB Events Space

Presenters:
Emma Batey, Northumbria University & Chris Howell, Durham University



IDEAs Projects

Teesside University

Innovation in Digital Health & Enterprise Awards

- Emma Barron, Vikki Rand & Annalisa Occhipinti

(she/her) (she/her) (she/her)

NorthFutures
Northern Health Futures Hub

Innovation in Digital Health & Enterprise Awards

UKRI Engineering and Physical Sciences Research Council

Introducing Innovation in Digital Health and Enterprise Awards (IDEAs) at our 6 regional universities



Emma Barron & Vikki Rand,
Teesside University

Contributors: Philip Leigh, Cumbria University; Chris Howell, Durham University; Emma Batey, Northumbria University; Sarah Best, Newcastle University; Yitka Graham, Sunderland University, Annalisa Occhipinti, Teesside University

University of Cumbria · Durham University · Newcastle University · Northumbria University NEWCASTLE · University of Sunderland · Teesside University

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Northern Health Futures Hub

Innovation in Digital Health & Enterprise Awards

UKRI Engineering and Physical Sciences Research Council

IDEAs

- Regional Case studies in Health-Tech
- Led by Business and Enterprise teams at the 6 universities
- Working together for the region
- Building a portfolio
- Drawing in investment



Contributors: Philip Leigh, Cumbria University; Chris Howell, Durham University; Emma Batey, Northumbria University; Sarah Best, Newcastle University, Yitka Graham, Sunderland University, Annalisa Occhipinti, Teesside University

University of Cumbria

Durham University

Newcastle University

Northumbria University NEWCASTLE

University of Sunderland

Teesside University

IDEAs - Aims and objectives

- The purpose of these awards was to enable each University to develop activity that reflects their expertise, services, facilities and assets
- This activity supports the establishment of digital health related translational research and innovation projects and develop partnerships with external partners
- Collectively, this activity will strengthen and inform the regional digital health offer and will result in increased engagement with partners (private, public and VCSE sector organisations)

IDEAs - Proof of concept funding

To support development of

- New opportunities for industry-academia partnerships
- Engagement with a broader group of stakeholders
- Future funding opportunities by generating early proof-of-concept
- Case studies and track record to demonstrate ‘the art of the possible’

University of Cumbria

Smart Sensors to Enable Enhanced Health Monitoring of individuals to support the extension of home or other location living (SSEEM)

Led by Prof Phil Leigh University of Cumbria

philip.leigh@cumbria.ac.uk

University of Cumbria

vytalair

Overview – health and environment

University of Cumbria

- Research being undertaken with the University of Cumbria and VytalAir (SME) examining the relationship between indoor housing conditions and health outcomes with the use of smart sensors (environmental monitoring) and other interventions
- The focus is on how environmental monitoring technologies may help housing providers and researchers better understand the conditions within residential properties and identify risks at an earlier stage
- The measurements provide insight into factors linked to indoor air quality, ventilation and moisture conditions, which are known to influence the development of damp, mould and other environmental hazards

Context and impact

University of Cumbria

- The research is set within a broader policy context that includes increased regulatory attention to housing conditions, including the introduction of Awaab's Law, which requires social landlords to investigate and address serious housing hazards within defined timeframes
- The findings will show the relationship between housing conditions, indoor environmental quality and health outcomes, with a particular focus on social housing settings. The study considers how environmental monitoring technologies may assist housing providers and researchers in identifying potential risks within the home environment and supporting earlier intervention

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University of Sunderland

To build and strengthen partnerships with third sector organisations and build collaborations through ECR capacity building



Open to academics and particularly PhD students & ECRS across the 6 Universities

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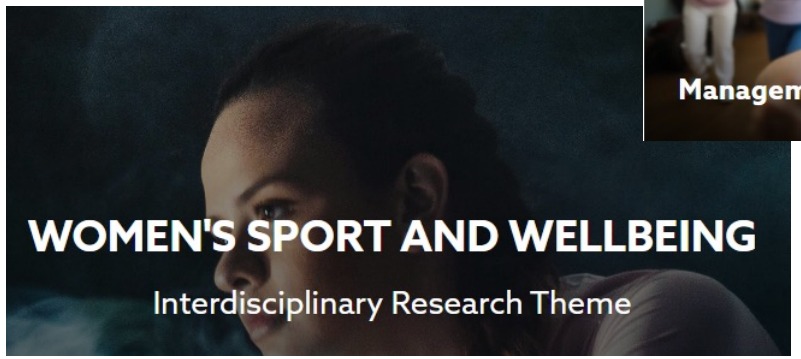
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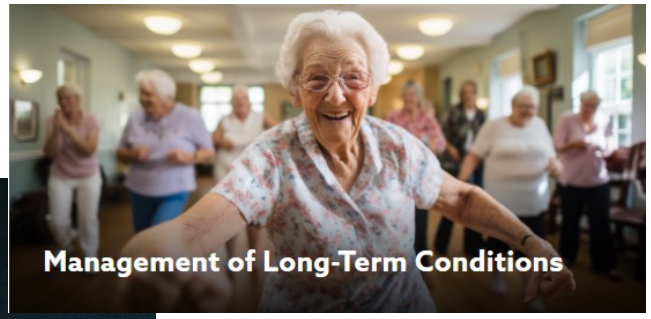
Faculty of Health and Wellbeing

Northumbria University NEWCASTLE

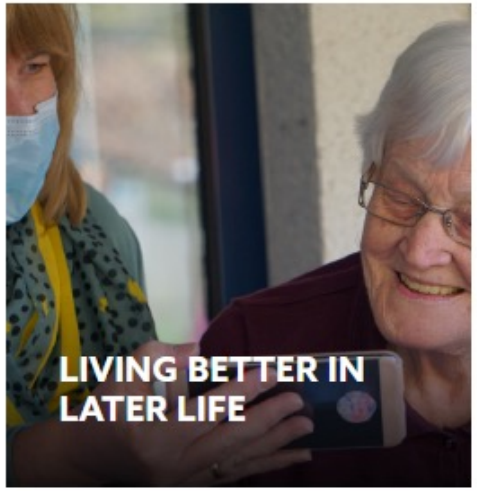






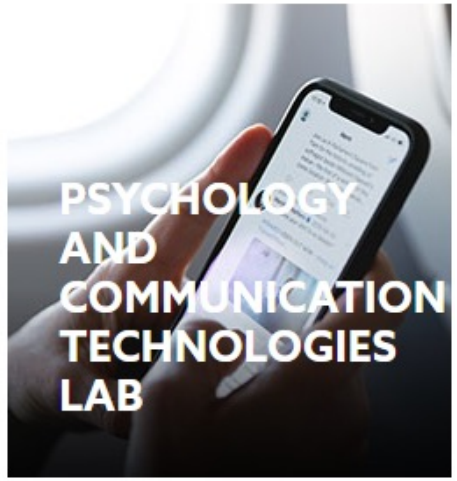












Northumbria University - Aims and objectives

Northumbria University NEWCASTLE

To establish a pioneering cross-disciplinary ecosystem working across sectors that empowers people to engage and lead in digital health and health-tech initiatives.

- Mapping exercise – identify existing research capacity, key stakeholders, partnership opportunities across the breadth of the University.
- Internal event to bring together researchers working across digital health
- To identify types of partnerships that are characterised by work on social equity, social justice, and or social inequality
- To conduct this work across all academic areas across the university by nominated themes
- External event to present key areas across Northumbria University in digital health and develop further opportunities for collaboration

Northumbria University – What we found

Northumbria University NEWCASTLE

- Research has been gathered from within the university undertaken within the field of social equity over the past 5 years.
- This has been categorised into 5 broad definitions: Practice, Population, Policy, Digital Health, Workforce Development
- We have narrowed down these findings to focus on those studies undertaken in the North East and Cumbria.
- Of those studies undertaken within the North East and Cumbria, we are developing a picture of the key funders and other stakeholders involved in these projects.

Northumbria University – Next steps

Northumbria University NEWCASTLE

- Synthesise findings in a final report to inform strategic development for Digital Health within CHASE.
- To be developed into a directory connecting best practice, practitioners, policy makers and communities.
- Directory will be published to support resources for local business, statutory and third sector organisations (NU-DSR). It will also support with building networks for future large bid applications.
- Event to launch directory and outline key priority areas across the University and highlight the future opportunities to build and develop relationships beyond NHF funding via CHASE. Event Autumn 2026

Newcastle University – Digital Health & Care in Rural Communities

Evidence, Innovation & Knowledge Exchange for the North East & Beyond

Newcastle University

Why this project?

- **Digital tools and technologies could help address key rural health challenges** including distance from services; lack of transport; workforce and skills shortages; isolation and hidden deprivation
- **BUT a 'digital first' approach could also exacerbate existing inequalities in rural areas** where there are gaps in digital connectivity, an older population and lack of support to build digital skills and confidence in these communities.



NICRE
National Innovation Centre
Rural Enterprise

Newcastle University – Digital Health & Care in Rural Communities

Evidence, Innovation & Knowledge Exchange for the North East & Beyond

Newcastle University

Aims

- Understand barriers and opportunities for digital health and care in rural communities in NENC
- Identify examples and innovative practice to ensure advances in digital health and care truly benefit rural communities locally and nationally
- Make evidence and practical tools accessible to practitioners, researchers, industry, policy-makers and community organisations



NICRE
National Innovation Centre
Rural Enterprise

Newcastle University – Digital Health & Care in Rural Communities

Evidence, Innovation & Knowledge Exchange for the North East & Beyond

Newcastle University

Our approach

- Review of existing evidence & insight
- Stakeholder workshop exploring examples, barriers and solutions
- Additional interviews and case study creation
- Innovation Portal module to make findings accessible to all

What we found

- Partnership working is more than good practice: it is essential for adoption and spread of digital health & care in rural communities
- Community-based, co-created & relationally delivered approaches outperform top-down digital deployment, particularly in deeper rural and farming communities
- Hubs like NorthFutures can play an important role in convening, facilitating cross-sector collaboration, & promoting understanding of rural contexts & communities.

Newcastle University – Digital Health & Care in Rural Communities

Evidence, Innovation & Knowledge Exchange for the North East & Beyond

Newcastle University

Next steps

- Innovation Portal module goes live
- National webinar in Autumn 2027

Learn more

- www.nicre.co.uk
- nicre@newcastle.ac.uk

NICRE National Innovation Centre Rural Enterprise



Teesside University - Aims and objectives

To establish two projects with SME partners to undertake proof of concept projects to provide case studies demonstrating expertise:

- Footfall – an instrumented insole for assessment of gait and balance
  – Prof Michael Drinnan (poster)
- AI Prediction of Surfactant Need in Preterm Babies
  – Prof Annalisa Occhipinti

(she/her)

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AI Prediction of Surfactant Need in Preterm Babies

Integrating Clinical Data & Lung Ultrasound Scores for Early Decision Support –

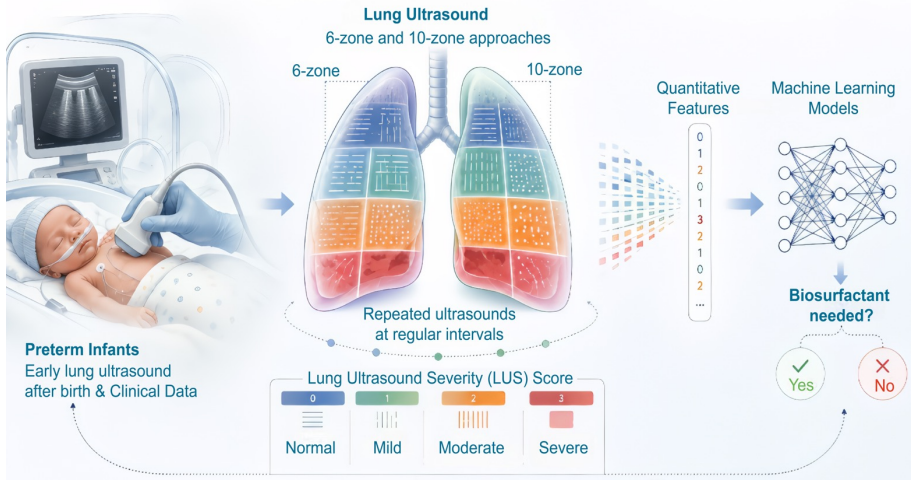
Annalisa Occhipinti

a.occhipinti@tees.ac.uk

In collaboration with:

Le Minh Thao Doan[1], Yordanka Karayaneva[1], Oki Ayobami[1], Vishnu Vardhan Kalva[1], Claudio Angione[1], Prakash Kannan Loganathan[2], Annalisa Occhipinti[1]

1. School of Computing, Engineering, and Digital Technologies, Teesside University, Middlesbrough, UK
2. Neonatal Unit, James Cook University Hospital, Marton Road, Middlesbrough, TS4 3BW, UK

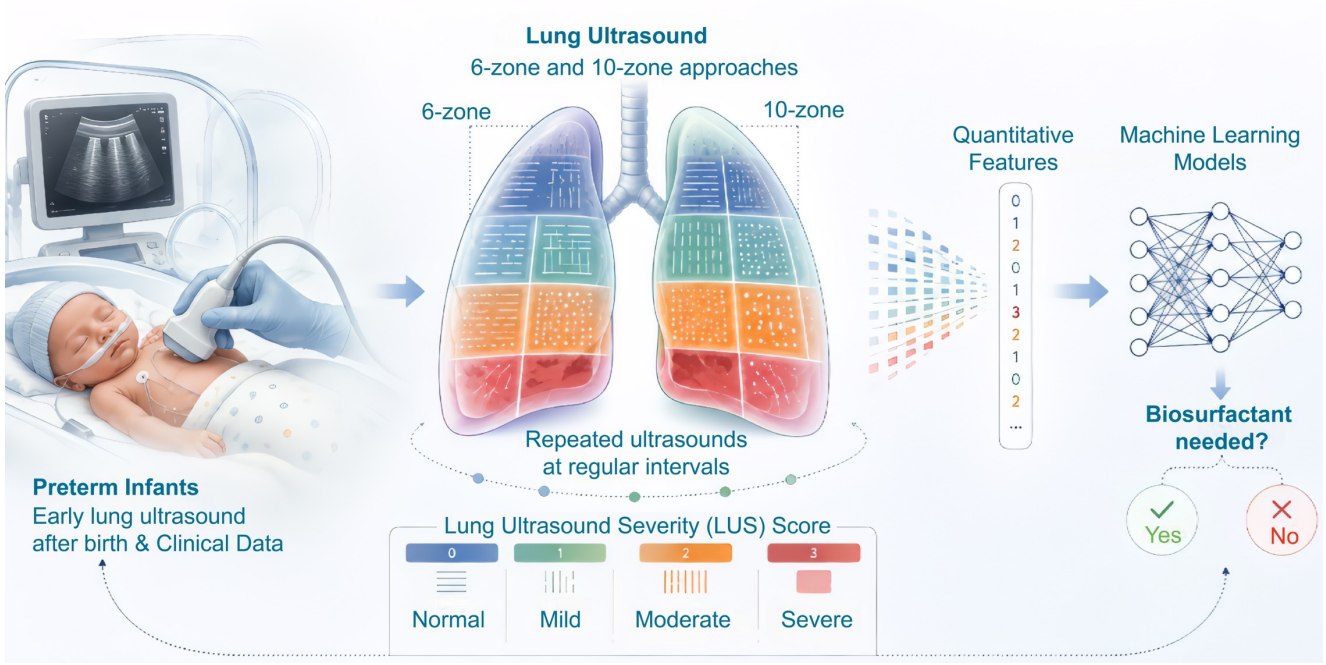


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- Preterm infants frequently develop **respiratory distress syndrome**
- Requiring rapid surfactant therapy
- **Early and accurate prediction** is key for respiratory outcomes.



- Current assessments rely on **subjective interpretation** of lung ultrasound (LUS) and clinical indicators
- Leading to **inconsistencies** in treatment decisions.

- Integrating available data to predict surfactant need using AI and provide a **decision-support tool for neonatologists**

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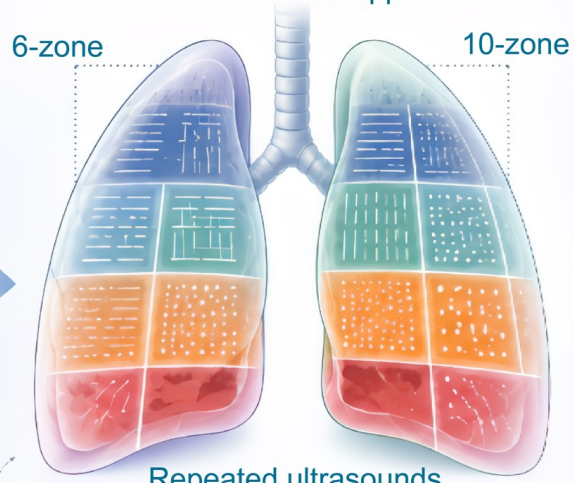
OBJECTIVE

Can biosurfactant need be predicted by Lung Ultrasound Scores and clinical variables?



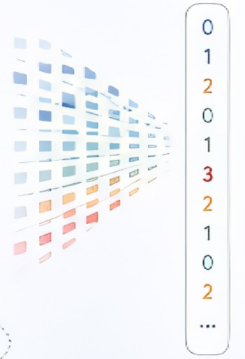
Preterm Infants
Early lung ultrasound after birth & Clinical Data

Lung Ultrasound
6-zone and 10-zone approaches

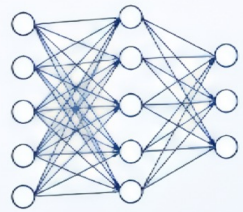


Repeated ultrasounds at regular intervals

Quantitative Features



Machine Learning Models

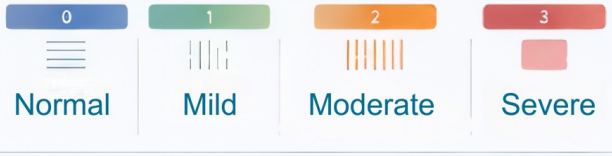


Biosurfactant needed?

Yes

No

Lung Ultrasound Severity (LUS) Score



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The SLURP Study Cohort



N = 83 Preterm Infants

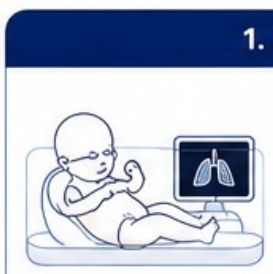
- Prospective observational study across James Cook University Hospital and collaborating NICUs.
- Data includes infants ≤34 weeks on non-invasive support within 3 hours of birth.

Loganathan, P. K., V. Meau-Petit, B. Bhojnagarwala, V. Nair, J. Holmes, A. Occhipinti, and M. Montasser. "Serial lung ultrasound in predicting the need for surfactant and respiratory course in preterm infants—multicentre observational study (SLURP)." European Journal of Pediatrics 184, no. 6 (2025): 356.

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1. STUDY OVERVIEW



83
pre-term babies scanned very shortly after birth
at the collaborators' hospital and other sites

LUNG ULTRASOUND PROTOCOL

6-ZONE APPROACH (Prone + Back)



Repeated 4 times at regular intervals

OR

10-ZONE APPROACH (All regions)



Repeated 4 times at regular intervals

SCANS OVER TIME (Both Approaches)



1st scan — 2nd scan — 3rd scan — 4th scan

SCORED BY CLINICIANS
Different clinicians with varying training levels (trainees to experts) assigned a severity score to each ultrasound.

LUS SCORE (Per zone: 0–3)

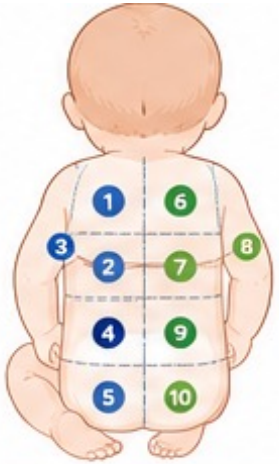
0	1	2	3
Normal (A-lines)	Mild (Few B-lines)	Severe (Coalescent B-lines / partial loss of aeration)	Consolidation (Complete loss of aeration)

A final total LUS score was calculated for each scan.

Lung Ultrasound Protocol

RIGHT

1. Right upper anterior
2. Right lower anterior
3. Right lateral
4. Right upper posterior
5. Right lower posterior



LEFT

6. Left upper anterior
7. Left lower anterior
8. Left lateral
9. Left upper posterior
10. Left lower posterior

Each zone is scored from 0–3 (0 = normal to 3 = consolidation).
10-zone total score range: 0–30 | 6-zone total score range: 0–18 (per position)

3. INPUT FEATURES (Predictor Variables)

1. CLINICAL MODEL

- Birth Gestational Age
- Birth Weight
- Sex
- Maternal Antenatal Steroids (Yes/No)
- Maternal Diabetes
- Multiple Pregnancy
- Mode of Delivery
- Admission Temperature (°C)
- Worst Base Excess in first 12 hrs
- Respiratory Support ≤3 hrs of life
- Inborn

2. FIRST ULTRASOUND CLINICAL VARIABLES (First LU Scan)

- SpO_2 at time of first LU scan
- Maximum FiO_2 at time of first LU scan
- Recent PCO_2 at time of first LU scan
- Silverman Anderson score at first LU
- Chest X-ray Score at first LU

3. LUS SCORES FIRST SCAN ONLY

- Total 10-Zone First Scan
- Total 6-Zone Prone First Scan
- Total 6-Zone Back First Scan

4. LUS SCORES ALL 4 SCANS

- Total 10-Zone First to Fourth Scan
- Total 6-Zone Prone First to Fourth Scan
- Total 6-Zone Back First to Fourth Scan

Note: 6-zone approach includes Prone + Back to account for position-dependent changes.

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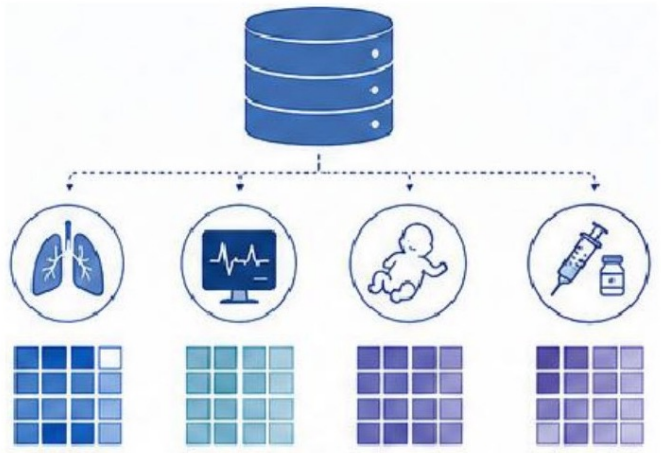
TARGET OUTCOME

Need for biosurfactant administration
(0 = No, 1 = Yes)

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Methodology

Input Variables Pre-processing



Lung Ultrasound Scan (LUS) Scores, Clinical and Respiratory Variables & Surfactant need are pre-processed and integrated

Modelling



Clinical Variables only

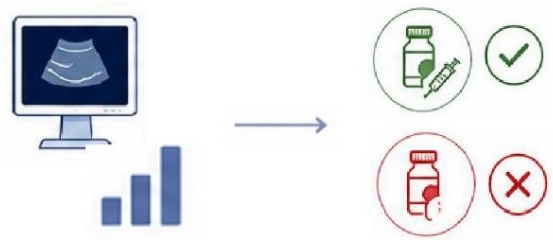
LUS and Clinical Variables

LUS First Scan only

LUS across all 4 Scans

Machine Learning algorithms are implemented to predict the need for surfactant, using four different feature groups

Evaluation



- All models are assessed using a 5-fold cross-validation approach
- SHAP/Explainability analysis is applied to identify the most relevant features in predicting surfactant needs

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Model Group	Key Predictors & Features	Clinical Significance
Clinical Model	GA, Birth Weight, Sex, Support ≤3hrs	Strong Predictors
US Meta-Variables	SpO2, FiO2, Silverman Score	Acute Severity
LUS 1st Scan	Total 10-Zone, 6-Zone (Prone/Back)	Initial Assessment
Longitudinal LUS	Total scores from Scan 1 to Scan 4	Dynamic Monitoring

Integrating longitudinal LUS and clinical metadata significantly improves model reliability and sensitivity

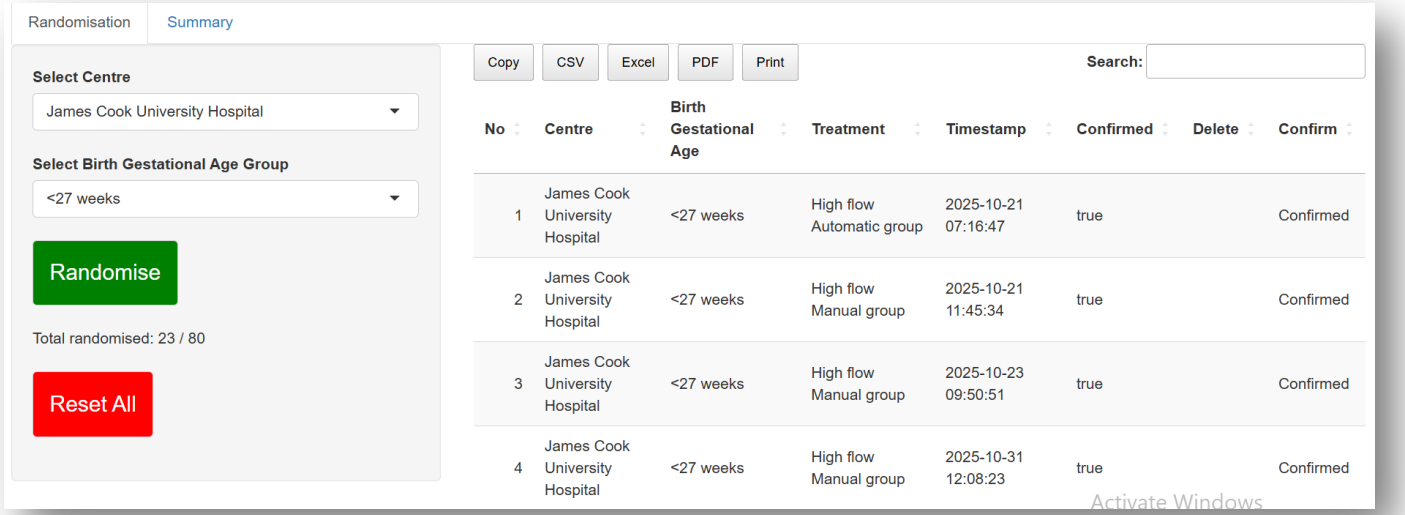


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NHS Foundation Trust
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Regional/Clinical Impact & Next Steps James Cook University Hospital

- Developed with direct relevance to the NENC neonatal care pathways.
- Aims to standardise respiratory assessments across local trusts.
- Potential to reduce clinical variability and support early treatment within the NHS.



Teesside University

Thank you

Le Minh Thao Doan, Yordanka Karayaneva, Oki Ayobami, Vishnu Vardhan Kalva, Claudio Angione, Prakash Kannan Loganathan



Annalisa Occhipinti
a.occhipinti@tees.ac.uk

Durham University
collaborating with Revela Health

Durham University

- Working with Prof. Noura Al-Moubayed at Durham University.
- Revela Health are a small start-up based in Newcastle-upon-Tyne.
- Revela are working with Durham to develop their AI medical clinician support tool to better help medical staff to identify potential cases of endometriosis for better patient health outcomes.

Chris Howell, Durham University

(he/him)

Durham University
collaborating with Revela Health

Durham University

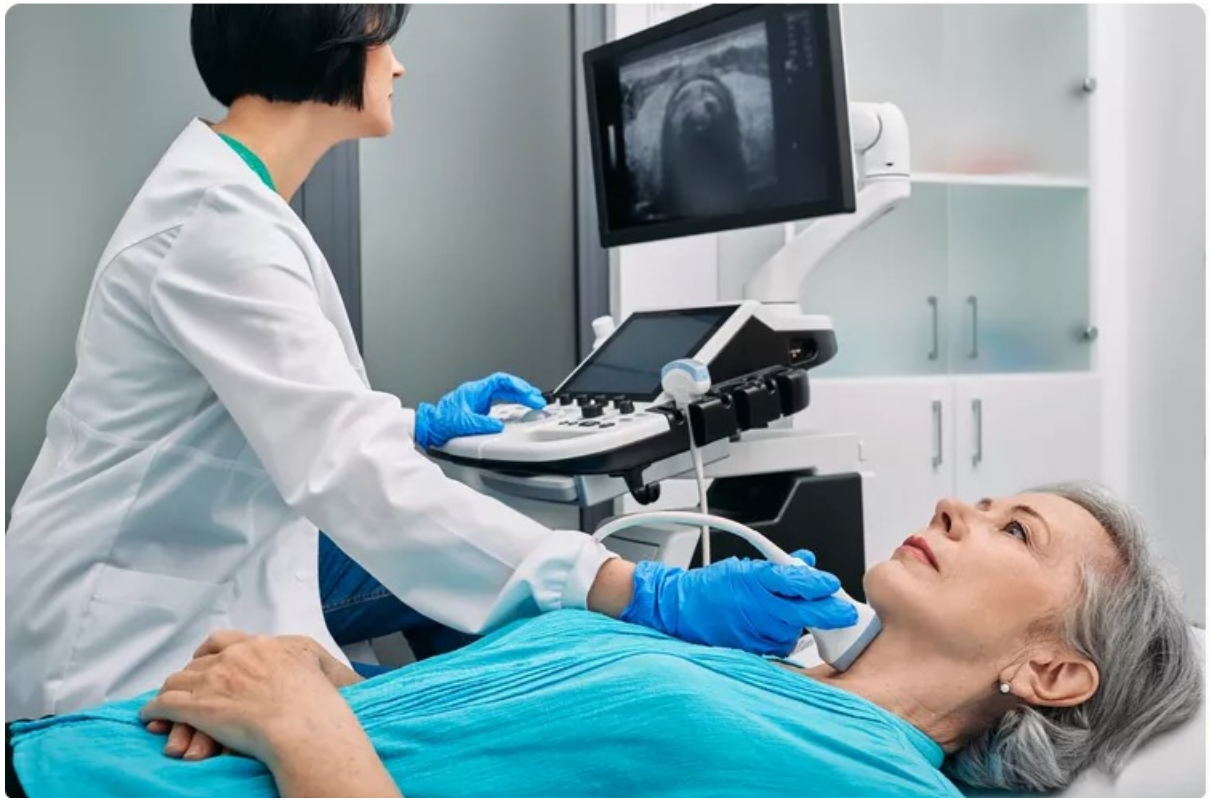


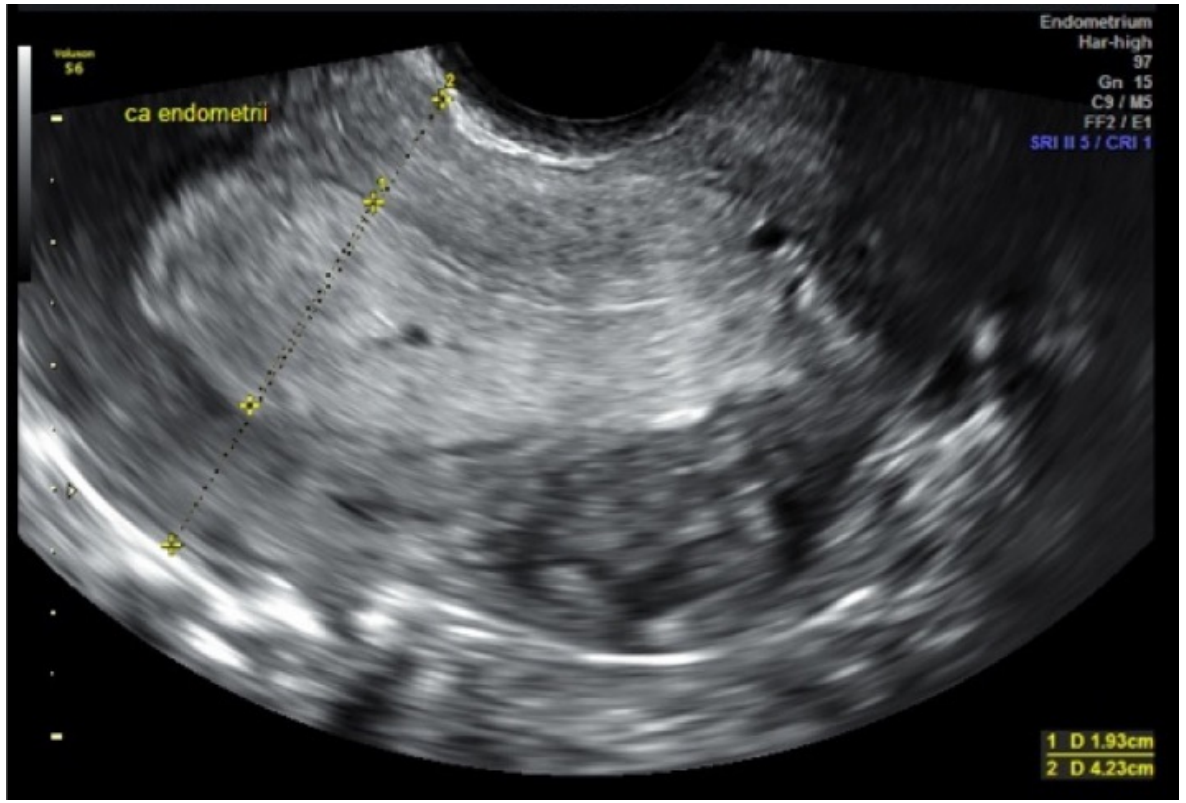


Durham University with Revela Health

Background

Durham University



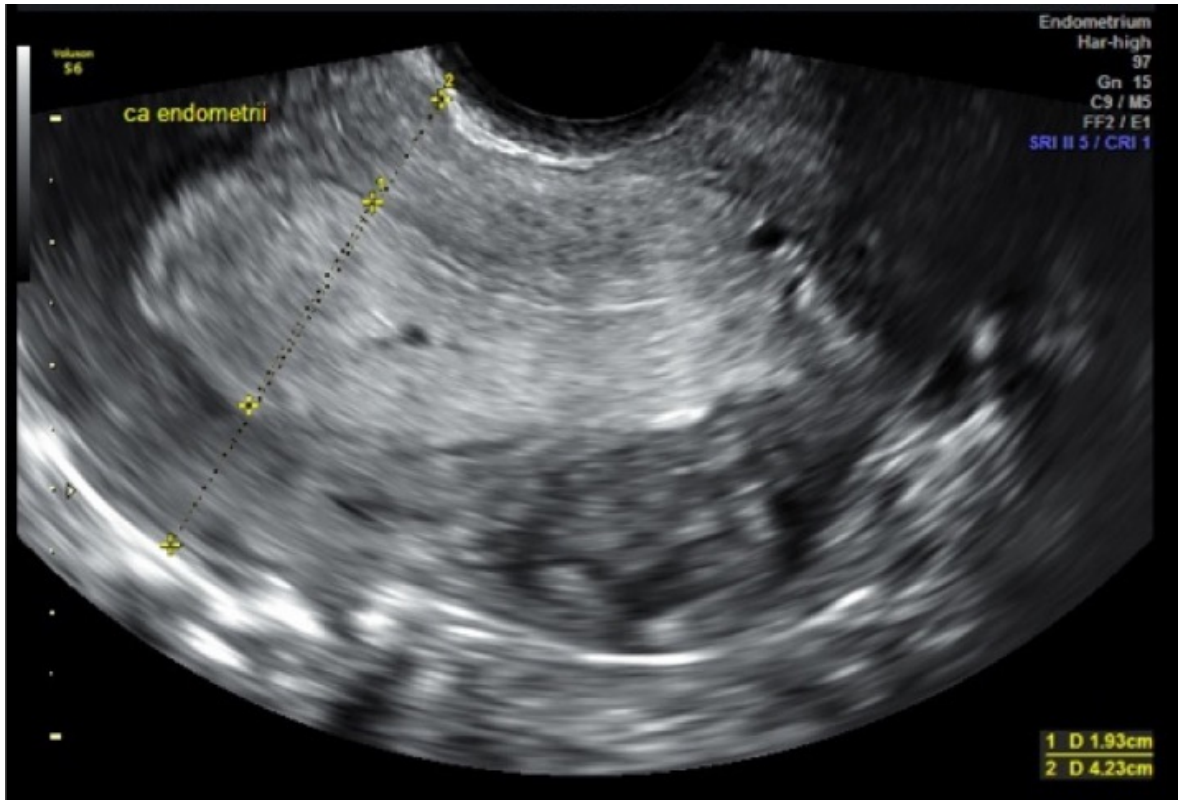


Durham University with Revela Health

Background

Durham University

- Endometriosis affects hundreds of millions of women worldwide, causing severe, chronic pain and significantly impacting quality of life.
- Patients experience unacceptable delays between their first GP presentation, receiving an official diagnosis, and starting treatment planning.
- Early-stage ultrasound scans are difficult to interpret accurately, leading to inconsistent results that heavily rely on specialised clinical expertise.

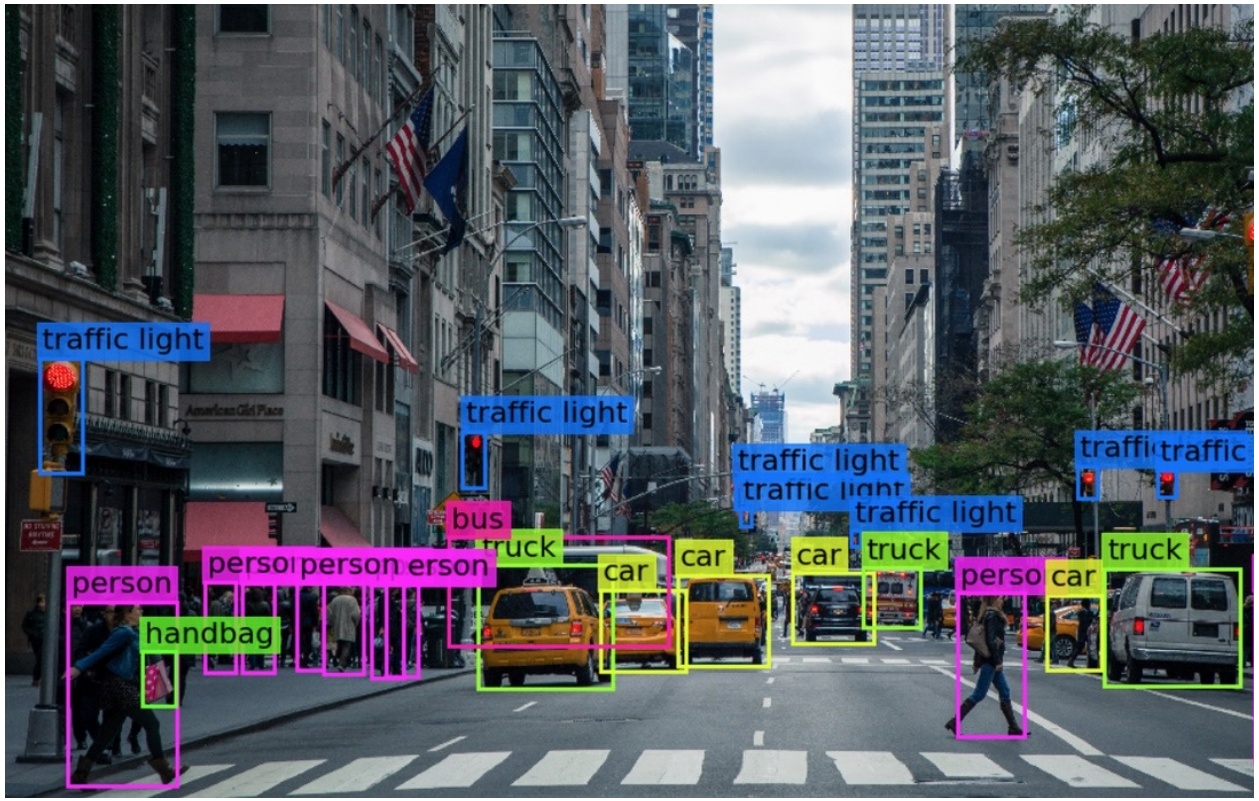


Durham University with Revela Health

Aims & Objectives

Durham University





Durham University with Revela Health

Durham University

Aims & Objectives

- **Leverage cutting-edge artificial intelligence to analyse early-stage diagnostic ultrasound scans with speed, accuracy, and consistency.**
- **Develop an intelligent software pipeline that automatically flags signs of endometriosis and returns a clear report for clinical review.**
- **Create a scalable tool embedded into current hardware and care treatment pathways designed to dramatically shorten the time between a patient's initial GP visit and an actionable treatment plan.**

Durham University with Revela Health

What we did

Durham University





Durham University with Revela Health

Durham University

What we did

- Partnered with Dr. Noura Al-Moubayed (Durham University) and Revela Health to merge advanced machine learning with clinical expertise and data provided from a NHS Trust.
- Revela build and trained computational models specifically optimized to process and analyse early-stage pelvic ultrasound images. DU developed an AI panel of judges to review the data and feedback in a summative report.
- Revela engineered a prototype reporting software that reads diagnostic scans and automatically highlights indicators of the condition for immediate medical review.

Durham University with Revela Health

Durham University

What we hope to find

- The AI successfully identifies subtle visual markers of endometriosis, proving it is capable of delivering rapid and highly reliable analysis.
- Demonstrate that the automated software could seamlessly generate targeted clinician reports early in the diagnostic timeline.
- Confirm that automating image review significantly lowers the dependency on immediate specialist availability, speeding up the overall workflow.

Durham University with Revela Health

Durham University

What we hope to find

- **Expand testing of the AI models using larger, more diverse patient datasets to further refine diagnostic accuracy.**
- **Optimize the software for seamless deployment directly into existing NHS and GP diagnostic imaging pipelines.**
- **A health economics study to validate that automating image review significantly lowers the dependency on immediate specialist availability, speeding up the overall workflow.**

Durham University with Revela Health

Durham University

So what? / next steps / contact

- **Expand testing of the AI models using larger, more diverse patient datasets to further refine diagnostic accuracy.**
- **Optimize the software for seamless deployment directly into existing NHS and GP diagnostic imaging pipelines.**
- **A health economics study to validate that automating image review significantly lowers the dependency on immediate specialist availability, speeding up the overall workflow.**

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IDEAs



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University of Cumbria

Durham University

Newcastle University

Northumbria University NEWCASTLE

University of Sunderland

Teesside University

NorthFutures
Northern Health Futures Hub

UKRI Engineering and Physical Sciences Research Council

Digital health in Tees Valley: bench to bedside to community

Darlington Science Park (BENCH)

Teesside University
Darlington Campus



NATIONAL HORIZONS CENTRE

Teesside University

CPI & RNA Centre of Excellence
Darlington College
STEM Skills Centre (2028)
Improved connectivity

Darlington Economic Campus



TEES VALLEY



University Hospital Tees (BEDSIDE)

NHS University Hospitals Tees

Tees Valley Research Alliance

Tees Valley Health and Care Innovation Zone (COMMUNITY)

STOCKTON ON TEES

- "Health Spine"
- Community Diagnostic Centre
- Neighbourhood Care
- NHS Hub (Debenhams)

Middlesbrough Campus

Teesside University

UNIVERSITY OF THE YEAR
TIMES HIGHER EDUCATION 2025
THE Awards 2025

School of Health & Life Sciences
Digital Life Building