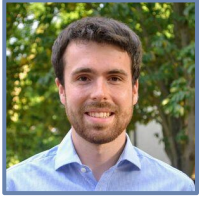


biophonics[®]

Introduction for Cambridge Enterprise Venture Partners
14th March 2023

Our Team



Dr. Andrew McDonald
CEO & Co-Founder

Research Associate,
University of Cambridge

Led R&D of technology,
including machine learning
(PhD awarded, University of
Cambridge), app and
embedded software

Managed MRC clinical research
project and collaborated with
NHS trusts, veterinary centres
and charities



Prof. Anurag Agarwal
CSO & Co-Founder

Professor of Acoustics and
Biomedical Technology,
University of Cambridge

20 years of leading research
projects in mechanical,
biomedical and aerospace
engineering

Collaborators include Dyson,
Rolls Royce, General Electric,
multiple NHS trusts and
hospitals in India

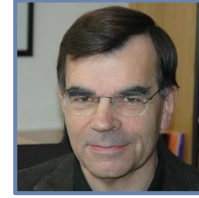


Prof. Rick Steeds
Chief Medical Advisor

Consultant Cardiologist,
Queen Elizabeth Birmingham,
Deputy Director of Clinical
Research, ICVS Birmingham

25+ years experience treating
patients, with a speciality in
valvular heart disease

Past President, British Society
of Echocardiography



Prof. Steve Young
Chairman

CBE FRS FREng

Emeritus Professor of
Information Engineering,
University of Cambridge

Serial entrepreneur:
Co-founder of Entropic
(acquired 1999, Microsoft),
VocalIQ (acquired 2015, Apple),
and Chairman of Phonetic Arts
(acquired 2010, Google)

A unique medical device to enable widespread
early detection of valvular heart disease

Valvular heart disease is a cardiac epidemic

1 in 9

over 65s have significant valvular heart disease - nearly 2 million people in the UK ^[1]

> 50%

are undiagnosed ^[1] and will progress to a late stage where the prognosis is worse than advanced-stage cancer ^[2]

£345 million

additional cost to the NHS per year because of treating patients at this later, symptomatic, stage ^[3]

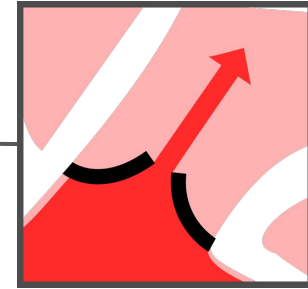
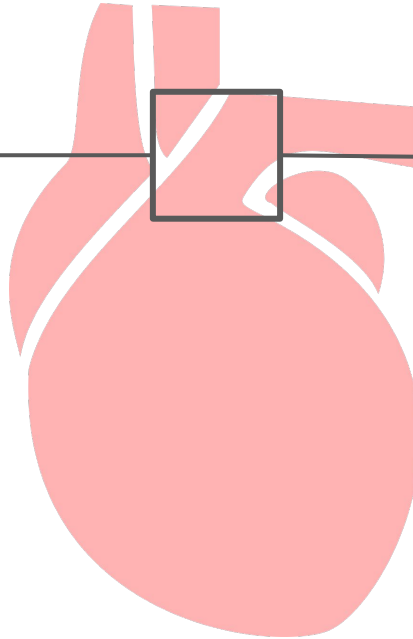
The NHS and NICE have identified early detection of VHD as a key goal ^[4,5]

Valvular heart disease (VHD) is difficult to detect



Healthy heart valve

Opens and closes to control blood flow



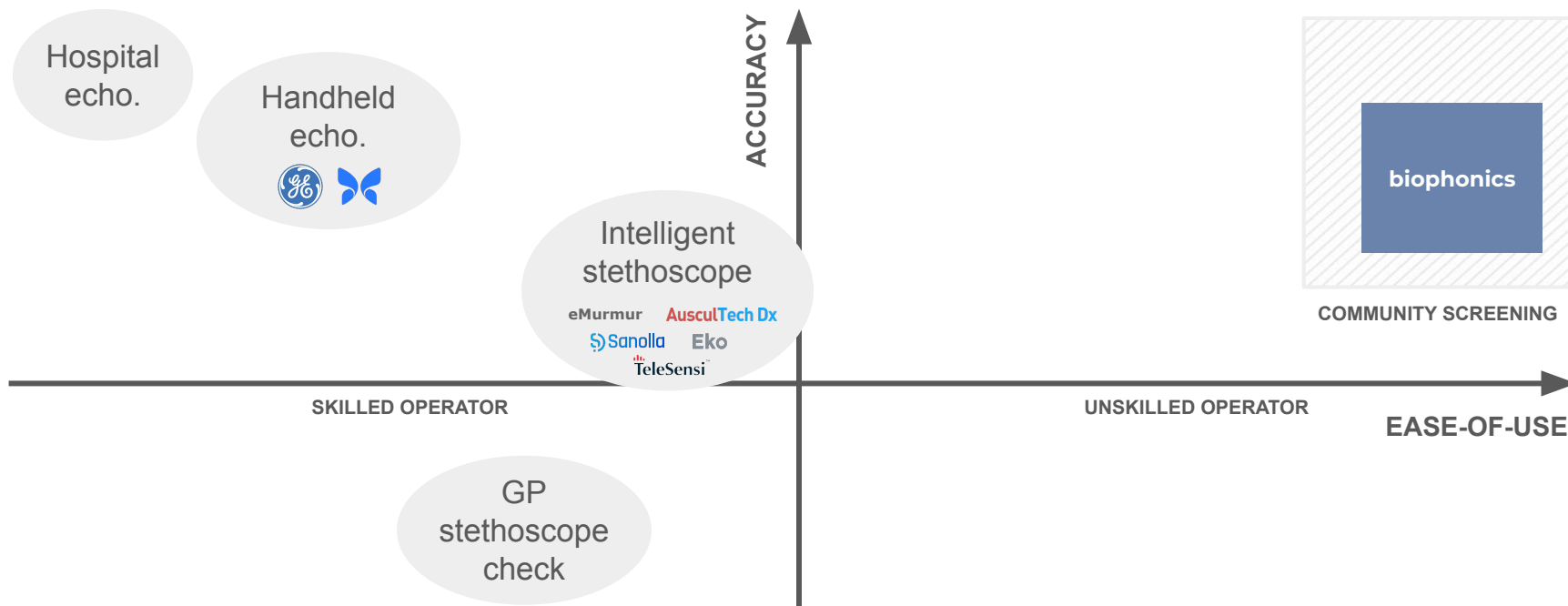
Diseased heart valve

Stiff or damaged; unable to fully open or close.

Reduces blood flow, leading to heart failure.

Clinical signs (breathlessness, fatigue, heart murmur) are often only noticed late

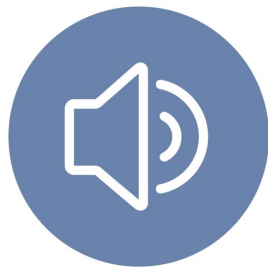
Existing tools cannot be used for screening



Community screening requires an accurate test performed by a non-skilled operator

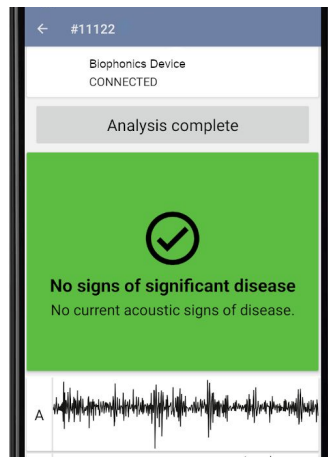
biophonics will enable community
screening of valvular heart disease

Our solution: a simple acoustic screening device



ACOUSTIC SENSOR

Makes recording heart sounds from the chest simple and straightforward



CONNECTED APP

Records sensor data and runs our AI in the cloud to predict signs of significant VHD

A quick and highly specific test for VHD that can be performed by anyone

World-leading AI for heart disease detection

AWARD-WINNING ALGORITHMS

- ✓ Filed patent in 2018 for first algorithm (WO2019171021A1)
- ✓ Won First Prize (out of 40 teams) in the international PhysioNet Challenge 2022, using patented algorithm
- ✓ Developed new algorithms to predict clinically significant VHD, using our proprietary data

DATA IS A BARRIER TO ENTRY

Designing VHD algorithms requires heart sound recordings and matching echocardiograms
no public data and requires specific trials



MRC trial in 5 NHS trusts
1250 patients recruited



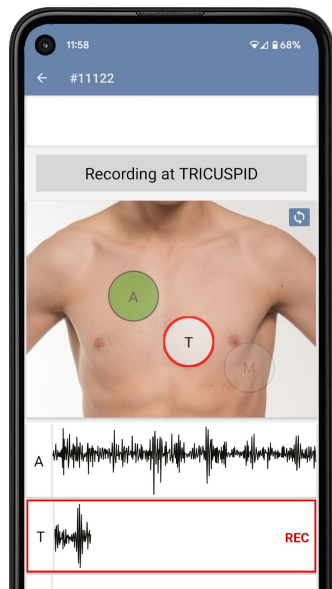
New collaboration with
KEM Hospital, Mumbai



Planning further trials and
collaborations in the NHS

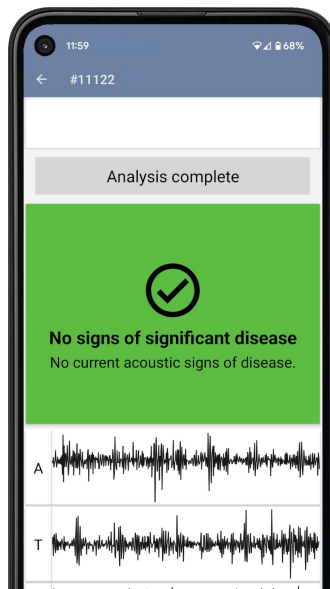
We are uniquely placed to maintain our world-leading status in algorithms and data

Enabling screening of VHD in a minute



1

Make 10-second recordings using device and app at three locations



2

Receive instant diagnosis from our AI software

An approach supported by key opinion leaders



Wil Woan

CEO
Heart Valve Voice

“The key to this incredible device is the accuracy with which it can detect a clinically significant murmur and the ease of training people to use it.” [1]



Dr. Tracey Vell MBE

Medical Director
Health Innovation Manchester

“These innovative technologies are the future of heart valve disease care ... many patients will benefit from earlier diagnosis.” [2]



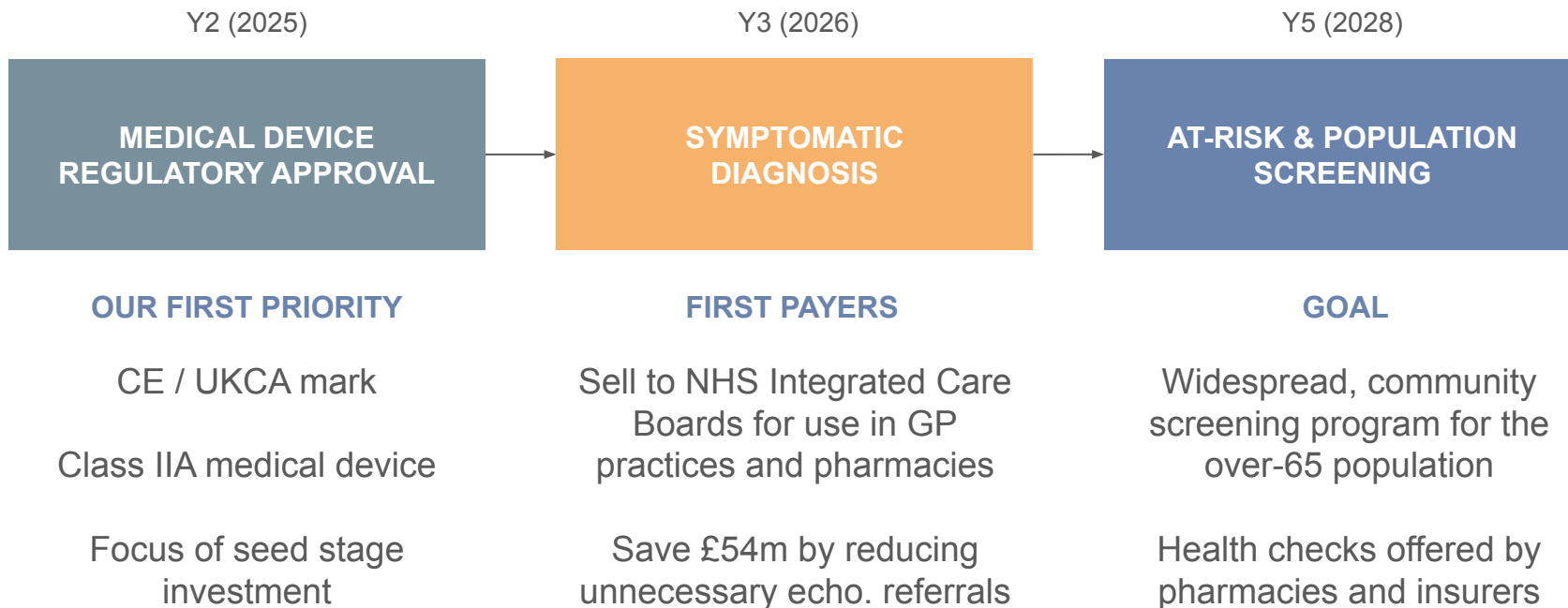
Nick Walker

UK Director
Edwards Lifesciences

“Earlier treatment and intervention is considered more effective for all patient outcomes”

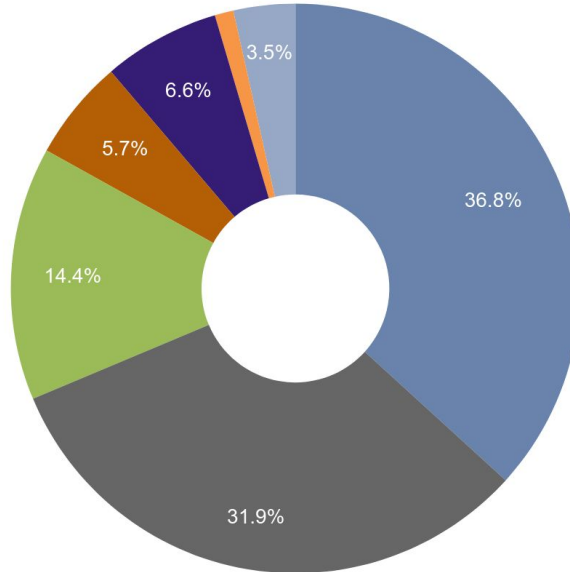
Our route to market

Our route to the UK screening market



Investment and use

- Personnel
- Technical consultant
- Dev. costs
- Regulatory consultant
- Infrastructure
- Health econ. consultant
- Advisors



BREAKDOWN OF COSTS

Seed investment of £1.9 million to build team, develop prototypes and finalise sales strategy

RECEIPTS


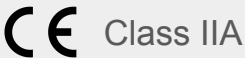

Investment	£1,900,000
R&D tax credits	£176,111

LESS PAYMENTS

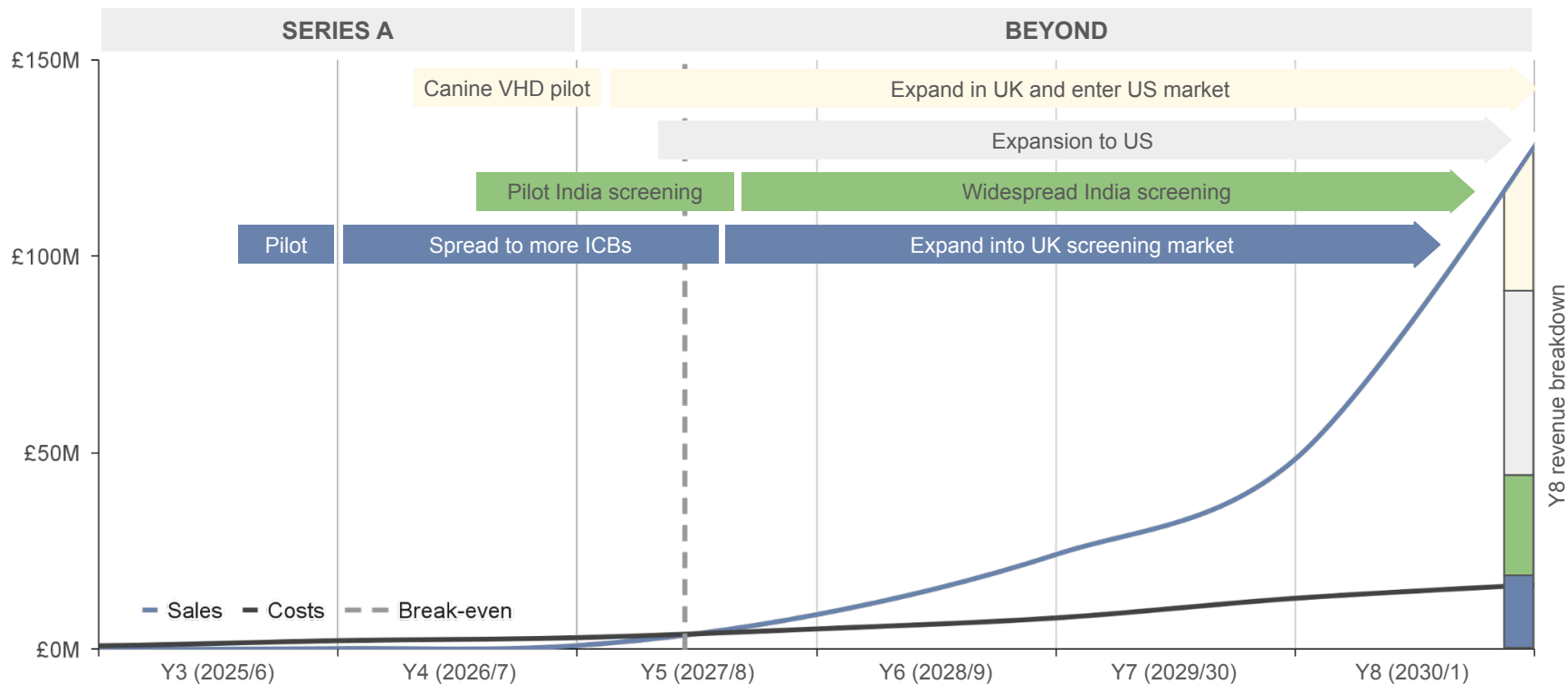
Personnel	£691,164
Technical consultant	£600,000
Dev. costs	£270,111
Regulatory consultant	£107,664
Infrastructure	£125,000
Health econ. consultant	£20,000
Advisors	£66,000

CLOSING BALANCE £196,172

Global market potential for VHD screening

	UK 1st market	India 2nd market	US 3rd market
Key customers	Integrated Care Boards	Health Ministry (screening)	Medicare
Example pricing model	Device cost & subscription	Device & per-test cost	Device & per-test cost
Healthcare burden	£345m wasted on late treatment	3.7m DALYs Up to 45% of all cardiac surgeries	\$2b wasted on late treatment
Key partnerships	Leading cardiologists, patient charities, health innovation centres	Cardiologist Dr. Girish Sabnis	In discussions with Medtronic and Edwards
Regulatory pathway			

Roadmap to future growth



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A unique device to detect valvular heart disease using a non-skilled operator with world-leading algorithms and data



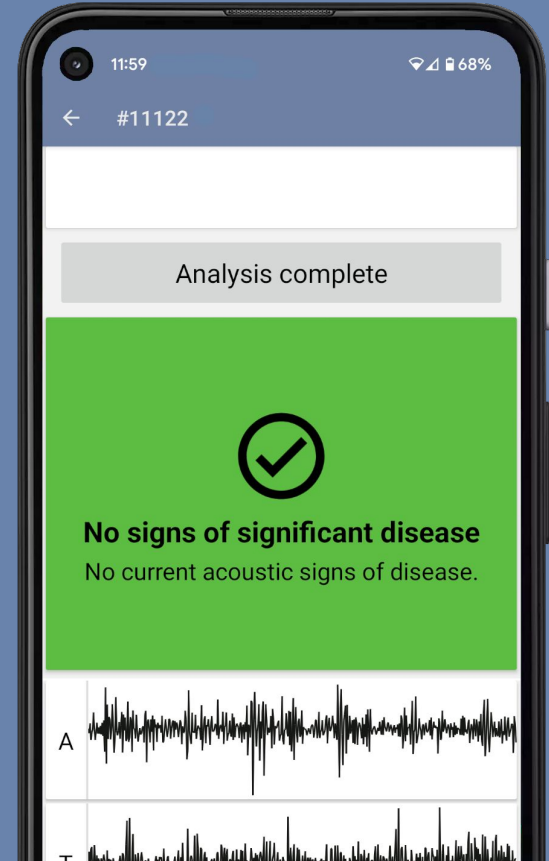
Improving early detection of VHD will save significant health costs and is a key objective of the NHS and other health economies



The target will be the at-risk screening market with initial focus on symptomatic diagnosis in the UK



Raising a £1.9m seed round to develop a medical-grade device



Contact

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**UNIVERSITY OF
CAMBRIDGE**

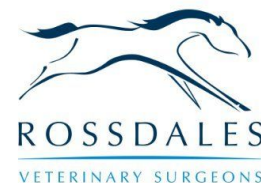
Andrew McDonald
CEO & Co-Founder

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acoustics.eng.cam.ac.uk

Appendix

Collaborators



Collaborators



Katja Kostelnik
Commercialisation Manager
Cambridge Enterprise



Emma Lawrence
Commercialisation Associate
Cambridge Enterprise



Amanda Wooding
Investment Director
Cambridge Enterprise



Jamal Butt FRPharmS
CEO, MedAdvisor UK, Non-Exec
Director, Croydon NHS Trust



Billy Boyle
Co-Founder and CEO
Owlstone Medical



Mark Gales
Prof. of Information Engineering
University of Cambridge



Bushra Rana
Consultant Cardiologist
Imperial College London



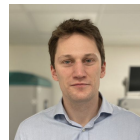
Girish Sabnis
Cardiologist
King Edwards Hospital Mumbai



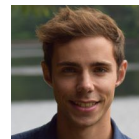
Len Shapiro
Consultant Cardiologist
Royal Papworth Hospital



Bernard Prendergast
Consultant Cardiologist
Guy's and St Thomas' Trust



Matthew Smith
Consultant ENT Surgeon
Cambridge University Hospitals



Max Nussbaumer
Research Associate
University of Cambridge



Celia Marr
European Veterinary Specialist
in Equine Internal Medicine



Jane Ladlow
Director of Research (Clinical)
Queen's Veterinary Hospital



Jose Novo Matos
Principal Clinical Cardiologist
Queen's Veterinary Hospital



Lara Barron
Head of Cardiology
Davies Veterinary Centre



Andrew Hatcher
Entrepreneur, JBS advisor,
and investor

Outreach and patient engagement



[BBC Interview](#)



[Parliament Awareness Event](#)



[Medtronic Bus Screening Tour](#)



[Innovation in VHD roundtable](#)



[ITV Interview](#)



[Patient Interaction Day](#)

Awards and grants

Date	Funding	£	Main Use
Sep 2022	MRC Confidence in Concept	100,000	Two grants to (i) further develop sensor prototype and (ii) develop novel dysphagia device
Feb 2021	Wellcome Trust Access to Expertise	15,000	Hire regulatory consultants to plan pathway to CE mark and 510k approval
May 2019	Medical Research Council Development Pathway Funding Scheme	802,000	Multi-centre NHS data collection & AI development
Dec 2018	Kennel Club Charitable Trust	18,000	Canine data collection & AI development
Sep 2018	EPSRC Impact Acceleration	10,000	Market survey
May 2018	Cambridge University Entrepreneur	5,000	Business Plan Award
Mar 2018	RAEng. Enterprise Fellowship	50,000	Explore commercialisation routes

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