Big Healthcare Challenges
in chronic disease

Oxford University Innovation, Oxford AHSN,
NIHR Oxford Biomedical Research Centre
Technology Showcase 2016

OXFORD UNIVERSITY INNOVATION
UNIVERSITY OF OXFORD
Oxford Academic Health Science Network
Oxford Biomedical Research Centre
NHS National Institute for Health Research
triteq

Programme

Saïd Business School (SBS) foyer

12:00 – 13:00	Registration, lunch, and exhibition

Nelson Mandela Lecture Theatre

13:00 – 14:00	Welcome – Linda Naylor, Managing Director Oxford University Innovation, Dr Nick Scott-Ram, Director of Commercial Development, Oxford AHSN and Dr Vasiliki Kiparoglou, Head of Operations NIHR Oxford BRC Keynote Speakers – Prof Tony Young and Dr Trevor Howe

PARALLEL SESSIONS

Nelson Mandela Lecture Theatre

14:00 – 15:15	**1A: COGNITIVE HEALTH AND NEURODEGENERATIVE DISEASE** Plenary Speaker and Session Chair: Dr John Davis, Chief Scientific Officer, Alzheimer's Research UK Oxford Drug Discovery Institute *(15 mins)*
	Brain Mapping Software – FSL, (FMRIB Software Library) FMRIB, Prof Saad Jbabdi *(15 mins)*
	Microdetect – Differential Diagnosis of Dementia, Prof Steve Chance *(15 mins)*
	Oxford Impedance Diagnostics – Parkinson's Diagnostic, Mr Andy Anderson *(15 mins)*
	Oxford VR – Virtual Reality for Treating Cognitive Disorders, Dr James Groves *(15 mins)*

Rhodes Trust Lecture Theatre

14:00 – 15:15	**1B: AGEING, FRAILTY & IMPROVING DELIVERY OF PATIENT CARE** Plenary Speaker and Session Chair: Prof Dan Lasserson, Clinical Lead for Diagnostics & Pathways, Wealth Creation Programme, Oxford AHSN *(15 mins)*
	Out of Hospital Emergency Multidisciplinary Unit, Prof Dan Lasserson *(15 mins)*
	WASP, Software for Surgeon Dexterity Training, Prof Jonathan Rees *(15 mins)*
	Pro-Mapp, Software for Managing Orthopaedic Care Pathway, Prof David Beard and Mr Toby Knightley-Day *(15 mins)*
	Towards a Personalised Surgical Pathway for the Elderly, Dr Helen Cui *(15 mins)*



PARALLEL SESSIONS

	Saïd Business School (SBS) foyer
15:15 – 16:00	Afternoon tea, exhibition and networking
	Nelson Mandela Lecture Theatre
16:00 – 17:15	**2A: DIABETES, OBESITY & HEALTH BEHAVIOURS** Plenary Speaker and Session Chair: Dr Jackie Prosser, Programme Lead Primary Care Mental Health and Ill Health Prevention, Chiltern CCG *(15 mins)*
	UK Prospective Diabetes Study Outcomes Model, Prof Alastair Gray *(15 mins)*
	BOUNTS, Incentives to get Active, Mr John Stuart *(15 mins)*
	SomaLogic, Precision Risk Profiling in Heart Disease and Stroke, Dr Steve Williams *(15 mins)*
	Islet Cell Transplantation as Alternative to Injected Insulin, Prof Paul Johnson *(15 mins)*
	Rhodes Trust Lecture Theatre
16:00 – 17:15	**2B: CARDIOVASCULAR DISEASE AND STROKE** Plenary Speaker and Session Chair: Prof Keith Channon, Director of the Oxford Biomedical Research Centre, Professor of Cardiovascular Medicine, University of Oxford *(15 mins)*
	Ultromics – Advanced Ultrasound Analysis Made Simple, Prof Paul Leeson *(15 mins)*
	Inflammation Quantification for CVD Risk, Dr Evangelos Oikonomou *(15 mins)*
	SEND – Track and Trigger Methods for Electronic Records in ITU, Dr Peter Watkinson *(15 mins)*
	LDLR Upregulators, Adjunct to Boost Statins, Mr Alastair Kerr *(15 mins)*
	Nelson Mandela Lecture Theatre
17:15 – 18:00	Expert Panel Discussion, and closing remarks by Prof Keith Channon
	Saïd Business School (SBS) foyer
18:00 – 18:30	Drinks and networking

Additional projects in the poster exhibition:

Diabetes Health Profile
Dr Keith Meadows

Nutrition and Dietetic Outcomes Questionnaire D
Dr Keith Meadows

Smartphone-Based Management Of Gestational Diabetes
Dr Lucy Mackillop & Prof Lionel Tarassenko

Evaluation of a Self-Administered Glucose Tolerance Test for Diabetes "Home OGTT" – James Jackson

Sleepio – The Sleep Improvement Programme
Prof Colin Espie

Correction Method for Magnetic Resonance Angiography
Dr Thomas Okell

MIDAS – The Myocardial Infarction Dimensional Assessment Scale
Prof Crispin Jenkinson

Drug Target for Atrial Fibrillation
Prof Barbara Casadei

Cardiolyse
Prof Illya Chaikovskyy & Dr Wenming Ji

Oxford Cardiomox
Prof Illya Chaikovskyy & Dr Wenming Ji

Telemetric Home Monitoring to Improve Blood Pressure Treatment After Stroke – Prof Peter Rothwell

Microc: a Simulation Environment to Study Cells
Prof Francesca Buffa

Valgus and Varus Stress Device for Knee Radiographs
Dr Thomas Hamilton

Elfin – Electronic Fracture Prevention Patient Datahub
Prof Kassim Javaid & Prof John Chelsom

Innovation Bridge Between Europe and China
Dr David Baghurst

Other organisations participating:

Denka Company Limited
Pursuing Next Generation Diagnostics

Johnson and Johnson Innovation

Medtronic
Let's take healthcare further, together

Oberd, a Product of Universal Research Solutions Llc-Usa
Addressing challenges in chronic disease with integrated technology

Sarissa Biomedical Ltd
Point of Care Stroke Diagnostic

Big Healthcare Challenges
in chronic disease

Linda Naylor
Managing Director
Oxford University Innovation

Every overnight success is preceded by years of hard work. This is just as true here at Oxford as in any vibrant innovation ecosystem worldwide.

Early-stage technologies from the University's world-class research are developed through spinout companies or by licensing to third parties.

Funding for protecting and marketing IP, an investor network including Oxford Sciences Innovation, and professional advice from legal, marketing and financial experts are all essential parts of the ecosystem.

In this Oxford Technology Showcase - our fourth - we're delighted to be working in partnership with the Oxford AHSN and the NIHR Oxford BRC to provide a window on the overnight successes of the future.

The huge diversity of outstanding projects presented today is spearheaded by some of the brightest and most committed minds in the world. By tackling the biggest challenges in chronic disease and healthcare together we are creating solutions which will benefit society in years to come.

Professor Keith Channon
Director of the NIHR Oxford Biomedical Research Centre
Professor of Cardiovascular Medicine, University of Oxford

The NIHR Biomedical Research Centre, Oxford (Oxford BRC) is a partnership that brings together the research expertise of the University of Oxford and the clinical skills of Oxford University Hospitals NHS Foundation Trust. The aim is to support the translation and innovation of basic scientific developments into clinical benefits for patients. Chronic diseases remain a major unmet medical need and are the focus of many Oxford BRC funded research projects. Based at the Oxford University Hospitals, the Oxford BRC is part of the Government's initiative run by NIHR to reinforce the position of the UK as a global leader in healthcare related research.

The Oxford BRC brings research from bench to the bedside. We initiate medical innovations keeping healthcare delivery and patient benefit central.

The Oxford BRC supports one of the largest clinical trial portfolios in the UK and has a successful 10 year track-record of taking discoveries from the laboratory into the clinic.

Dr Nick Scott-Ram
Director of Commercial Development
Oxford AHSN

Oxford Academic Health Science Network

In the NHS Five Year Forward View, the changing face of healthcare was placed at the centre of an NHS undergoing profound transformation, with the creation of new pathways of care across different care settings, and the role of science and technology in providing new opportunities to patients who live longer and require better management of complex health issues. The 2016 Tech Showcase focuses on the big challenge of chronic disease management.

The challenges presented by long-term conditions call for increased connectivity and partnership across the whole innovation pathway. The Tech Showcase provides a snapshot of what this closer collaboration looks like, embracing a highly developed ecosystem of partners, across a very broad range of new opportunities that follow a clear pathway towards adoption. The close working relationship between the University of Oxford, Oxford University Innovation, the Oxford Biomedical Research Centre and the Oxford AHSN is highlighted in the programme, ultimately leading to new evaluation and adoption pathways for patient benefit across the Thames Valley and Oxford region.

Angela Hobbs
Commercial Director
Triteq

triteq
making products happen

Triteq is an innovative product design, development & technology consultancy made up of talented teams of brilliant people working together to produce incredible products for a rapidly changing world. Our award winning designs are found in hospitals, homes, offices, manufacturing plants, construction sites, airplanes, laboratories and retail outlets all around the world. We have an exemplary track record in medical product design and have supported many start-ups through each stage of the development process. We listen, ask the right questions and deliver results on time. With a team of fifty in our Hungerford office, plus our sales and marketing team in Oxford, we can respond effectively to our client's needs. It is impossible to be aware of every single challenge, across an extensive range of industry sectors; our strength is knowing how to manage the process for successful outcomes. I look forward to hearing from you at the event.

About Oxford University Innovation

Oxford University Innovation is the research and technology commercialisation company of the University of Oxford. We provide access to technology from Oxford researchers through intellectual property licensing, spinout company formation and material sales, and to academic expertise through Oxford University Consulting.

Oxford University Innovation is the highest university patent filer in the UK and is ranked 1st in the UK for university spin-outs, having created over 110 new companies in 25 years. In the last financial year we completed 529 licenses and consulting agreements. Isis Enterprise, our innovation management consultancy, works with university, government and industrial clients from offices around the world.

About the NIHR Oxford Biomedical Research Centre

The NIHR Biomedical Research Centre, Oxford is based at the Oxford University Hospitals NHS Foundation Trust and run in partnership with the University of Oxford. It was one of five centres funded by the NIHR in 2007 through a competitively awarded grant of £57m over five years. In April 2012, as recognition for its outstanding contribution to healthcare research it was awarded a further 5 years funding at an increase of 50% to support translational research. Biomedical Research Centres are part of the Government's initiative to translate basic scientific developments into clinical benefits for patients reinforcing the position of the UK as a global leader in healthcare research.

About the Oxford AHSN

The Oxford Academic Health Science Network is licensed by NHS England and covers a population of 3.3 million living in Berkshire, Buckinghamshire, Milton Keynes, Oxfordshire and Bedfordshire. Our vision is Best health for our population and prosperity for our region, which is delivered by bringing together universities, industry and the NHS to improve prosperity in our region through rapid clinical innovation adoption. We have four objectives:

- Focus on the needs of patients and local populations
- Speed up adoption of innovation into practice to improve clinical outcomes
- Build a culture of partnership and collaboration
- Create wealth through co-development, testing, evaluation and early adoption of new products and services.

About Triteq

Triteq was founded in 1992, by Steve Lane and Jackie Berry, who are passionate about product design and making excellence available to everyone, from start-ups and SMEs to blue chip companies. Diversity of projects ensures our teams are constantly addressing new challenges, which means drawing on our strengths and our experience in managing the knowns and unknowns that can potentially emerge. We work on early identification of opportunities and risks to significantly increase value, adding commercial reality to early stage projects and increasing the importance and worth of your intellectual property.

Keynote Speakers

Professor Keith Channon, Director, NIHR Oxford Biomedical Research Centre
Closing remarks after the expert panel at 1800hrs

Professor Channon is Director of the National Institute for Health Research (NIHR) Biomedical Research Centre (BRC) at Oxford University Hospitals NHS Trust and the University of Oxford, Director of R&D for Oxford University Hospitals NHS Trust and Professor of Cardiovascular Medicine at the University of Oxford. He is also an Honorary Consultant Cardiologist at the John Radcliffe Hospital, Oxford. He runs a basic science research group interested in the biology of vascular disease and atherosclerosis, particularly using genetic models.

Professor Channon has served as Chairman of the British Atherosclerosis Society, as a member of the Council of the British Cardiac Society and a member of the British Society for Cardiovascular Research and the British Cardiac Intervention Society. He has acted as a Consultant and External Reviewer for the National Institute of Clinical Excellence, the Gene Therapy Advisory Committee of the Department of Health and the Medicines and Health Care Regulatory Authority.

Professor Tony Young,
National Clinical Lead for Innovation NHS England

Tony is a practicing frontline NHS surgeon, Director of Medical Innovation at Anglia Ruskin University, and has founded 4 Med-Tech start-ups. He has also co-founded the £500m Anglia Ruskin MedTech Campus which will become one of the world's largest health innovation spaces. In 2014 he was appointed as National Clinical Director for Innovation at NHS England. Here he provides clinical leadership and support in delivering improved health outcomes in England and drives the uptake of proven innovations across the NHS, promotes economic growth through innovation and helps make the NHS the go place on the planet for medical innovation.

In his words, Young is a "mad inventor," but to that fictional image add a hard nose; Young has seen his MedTech inventions to market, remortgaging his own home along a convoluted journey. Young's ideas, including products and systems to deliver flexible endoscopy to locations across the UK where on-site decontamination is not available or possible, have attracted £5 million of private investment and created the first innovation centre within an NHS hospital.

Dr Trevor Howe,
Director, Johnson & Johnson

Trevor is European Director for External Innovation, Discovery Sciences in Janssen. He is responsible for identifying and developing pre-competitive activities and consortia. In addition he assists in developing commercial propositions for Janssen and J&J which may address fundamental failures or new modalities in the drug discovery process. He joined Janssen in 2003 where he formed the Molecular Informatics group to focus on structural biology, biophysics & computational methods for ligand identification and optimisation in all phases of pre-clinical drug discovery process. Prior to Trevor's current Johnson & Johnson/Janssen career, he headed the worldwide Computational Chemistry Council for Novartis from 1997 – 2003. He also led several immunology projects which resulted in successful clinical candidates for the respiratory disease therapeutic area. Trevor serves on several UK scientific advisory bodies and boards, including the Structural Genomics Consortium (SGC) in Oxford and Toronto. He is a visiting Industrial Fellow at Bristol and Cardiff Universities.

Expert Panel Chair

Dr Stephen MacMahon, Principal Director and Co founder of the George Institute for Global Health

Dr Stephen MacMahon is Principal Director and Co-founder of The George Institute for Global Health. He also holds positions as Professor of Medicine and James Martin Fellow at the University of Oxford and Professor of Cardiovascular Medicine at the University of Sydney. The George Institute is a research and development organization with 500 staff located at centers in Australia, China, India and the UK. Its primary goal is improvement of the healthcare provided in major emerging economies, and its focus is on the management of those chronic conditions responsible for most premature deaths. Stephen is also the founder of George Health Enterprises Limited, a wholly owned subsidiary of The George Institute devoted to building social enterprises that deliver products and services designed to reduce the global burden of disease. For his research achievements in cardiovascular medicine, Stephen has been elected a Fellow of the Australian Academy of Science, the British Academy of Medical Sciences and the Australian Academy of Health & Medical Sciences. In 2013, he was named by EY as Social Entrepreneur of the Year. In 2016, he was named by Thomson Reuters as one of the "World's Most Influential Scientific Minds".

Expert Panel Members

Mike Rayner BA, DPhil, Professor of Population Health, Director, British Heart Foundation Centre on Population Approaches for Non-Communicable Disease Prevention

Mike Rayner is a Professor of Population Health at the Nuffield Department of Population Health at the University of Oxford and Director of the British Heart Foundation Centre on Population Approaches for Non-Communicable Disease Prevention, based in the department. The Centre, which Mike founded in 1993, is a World Health Organisation Collaborating Centre and carries out research in two main areas: the burden of cardiovascular disease and the promotion of healthier diets and levels of physical activity. Mike is also Chair of Sustain: the alliance for better food and farming in the UK and Chair of its Children's Food Campaign. He is Chair of the Nutrition Expert Group for the European Heart Network. He is also an ordained priest in the Church of England.

Alastair Gray Professor of Health Economics, Director of the Health Economics Research Centre, University of Oxford

Alastair Gray is Professor of Health Economics and Director of the Health Economics Research Centre, University of Oxford. His research focuses on the use of economics to improve resource allocation and decision making in health care, particularly using clinical trials and other robust methods to estimate the likely cost-effectiveness of new and existing health care interventions. His work spans many different clinical areas, from psychiatry to neurosurgery and care of the elderly, but with particular interests in diabetes, cardiovascular disease and population screening. Quality of life is a crucial aspect of much of this work, and so he is also interested in the methodologies used to measure and value different health states, different conceptions of quality of life, and the association between different quality of life measures. He also has research interests in wider economic aspects of health care, notably the impact of demographic change and ageing populations on health systems.

Professor Sarah Harper, Director, Oxford Institute of Population Ageing

Sarah serves on the Prime Minister's Council for Science and Technology, which advises the Prime Minister on the scientific evidence for strategic policies and frameworks. She currently chairs the UK government Foresight Review on Ageing Societies, and the European Ageing Index Panel for the UNECE Population Unit. She is a Governor of the Pensions Policy Institute. Sarah was the first holder of the International Chair in Old Age Financial Security, at the University of Malaya (2009/10) and her research was recognised by the 2011 Royal Society for Public Health: Arts and Health Research Award.

Sarah has a background in anthropology and population studies and her early research focused on migration and the social implications of demographic change. Her current research on demographic change addresses the global and regional impact of falling fertility and increasing longevity, with a particular interest in Asia and Africa. Recent research has focused on women's education and empowerment in sub-Saharan Africa, and the impact of this on falling fertility rates. Sarah has just completed a monograph on Population Challenges for Oxford University Press (2015), and is working her next book for Cambridge University Press Population and Environmental Change.

Professor Kazem Rahimi Deputy Director, The George Institute for Global Health

Prof Kazem Rahimi is a cardiologist with research interests in the area of clinical trials and health services research.

As the Deputy Director of The George Institute for Global Health, Kazem leads the Healthcare Innovation and Evaluation programme, which aims to find practical and affordable solutions for the global health priorities of the world¹s largest emerging economies, as well as the priorities of vulnerable or disadvantaged populations in established economies.

Kazem graduated in medicine from the University of Leipzig in Germany with postgraduate training in cardiology, epidemiology, clinical trials and health services research in Leipzig, London and Oxford. Prior to joining the George Institute, in 2010, he was a Research Fellow at Oxford's Clinical Trial Service and Epidemiological Studies Unit. His research interests include hypertension, heart failure and cardiovascular risk management, using a variety of methodologies such as individual-patient meta-analysis, large-scale complex intervention trials, and digital health technologies.

Kazem is currently the Chief Investigator of several large-scale projects and programmes including the SUPPORT-HF (a trial of remote self-management support in patients with heart failure), UNVEIL-CHF (a programme of research into variation in management of heart failure patients using large clinical datasets), BPLTTC (an international collaboration of blood pressure lowering trialists) and the SUPPORT-CVD trial (a large-scale cluster RCT of risk-stratified prevention and management of CVD with the use of low-cost technologies including the cardiovascular polypill).

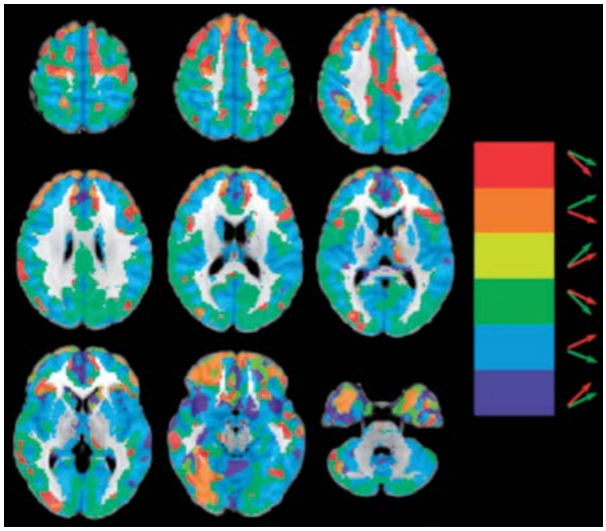
The FMRIB Software Library

Oxford Centre for the Functional Magnetic Resonance Imaging of the Brain Software Library

The FMRIB Software Library (FSL) is a comprehensive library of analysis tools used worldwide to quickly and effectively analyse complex brain imaging data.

The Oxford Centre for Functional Magnetic Resonance Imaging of the Brain (FMRIB) is a multi-disciplinary neuroimaging research facility, which focuses on the use of Magnetic Resonance Imaging (MRI) for neuroscience research, along with related technologies such as Transcranial Magnetic Stimulation, Transcranial Direct Current Stimulation and EEG. FMRIB is composed of research groups studying all aspects of brain imaging, including physics, analysis, basic science and clinical neuroscience.

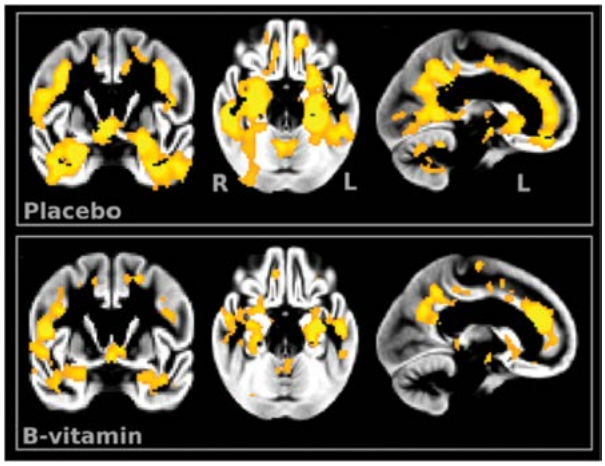
To assist researchers in the often complex and labour intensive analysis of MRI data, an innovative team, led by Professor Steve Smith, began developing the FMRIB Software Library (FSL) in 1998. Their algorithms worked robustly on a wide variety of real data, and they also generated leading-edge mathematical theory feeding into what was rapidly becoming a powerful standalone analysis pipeline.



Binarised representation of all the combinations of grey matter development over 2.5 years between healthy adolescents (green arrows) and the schizophrenic patients (red arrows). [Dauaud et al, 2009]

FSL was released in 2000 and has received over 2,500 citations. The latest version has been downloaded over 10,000 times and is used in nearly 1,000 hospitals and university labs.

This success has been hard earned. For over ten years the core team has continually developed, refined and extended FSL, as well as creating extensive documentation and training courses with over 1,000 attendees since 2002, and maintains an active user community through its email support list.



Regional loss of Grey Matter (GM) volume in placebo and B-vitamin groups. Placebo-and B-vitamin–treated groups showed significant reduction of GM volume over the 2-year period in similar regions. The extent and significance of volume loss appeared markedly greater in the placebo group compared with the B-vitamin group and is confirmed by direct statistical comparison. [Dauaud et al, 2013]

With the addition of a user-friendly graphical interface, and a high degree of automation, this robust, powerful and flexible analysis pipeline is now the recognised standard in academia for multi-modal MRI analysis. FSL is also commercially licensed to 7 of the top 10 global pharmaceutical companies and many others, whose activities range from drug discovery and clinical trials to neuromarketing, and even iPhone app development.

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Microdetect
– Diagnosis of Dementia, Autism and Other Conditions

A new level of precision in brain measurements identifies patterns in the microstructure of the human brain which can be used to classify a range of cognitive and neurological diseases.

In England alone there are more than 670,000 people with dementia. 350,000 remain undiagnosed and without access to support. Over the next 30 years, the cost of dementia in England is set to rise by £19 billion. In order to minimise cost and improve care for an ageing population, improvements in diagnosis need to be made.

Autism is a developmental condition with brain effects that are too subtle to detect with conventional brain imaging methods. 1% of the human population have autism but many are undiagnosed. The cost of autism in the UK is estimated at £32 billion per year and improved diagnosis is crucial to enable intervention and support in early life.

Diagnosing Dementia

Diagnosis of Alzheimer's disease and other dementias can only be confirmed by post-mortem examination. 'Probable diagnosis' in life depends on clinicians' judgement and current brain imaging tests rely on imaging agents which are expensive and radioactive.

Diagnosing Autism

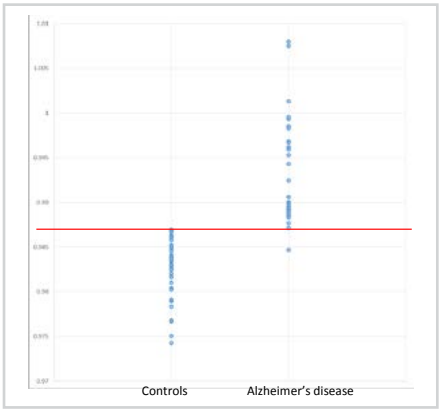
Current methods depend on clinicians' judgement and family interviews. No brain imaging or other biological test currently exists.

Oxford Invention

Unique new diffusion MRI measurements which are low cost, non-invasive and do not rely on ionising radiation have been developed by scientists at the University of Oxford. The technology establishes signature patterns in the microstructure of the human brain which can provide differential diagnosis between dementias such as Alzheimer's disease (AD) and cerebrovascular dementia (CVD) in late life, or detection of developmental conditions such as autism in early life. It is expected this technology could have positive implications for the clinical management of patients with cognitive diseases.

The Oxford invention has been developed through studies of post-mortem histology of the brain and with diffusion tensor imaging (DTI) MRI scans.

A patent application protecting a broad range of microstructural signature patterns of disease in the human brain has been filed. Further development work is ongoing.



99% classification accuracy (80/81 subjects) using just one of the new measures (Two different study datasets using conventional MRI scanners in UK and Italy have been combined)

Professor Steven Chance
Associate Professor in Clinical Neurosciences
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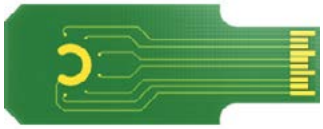
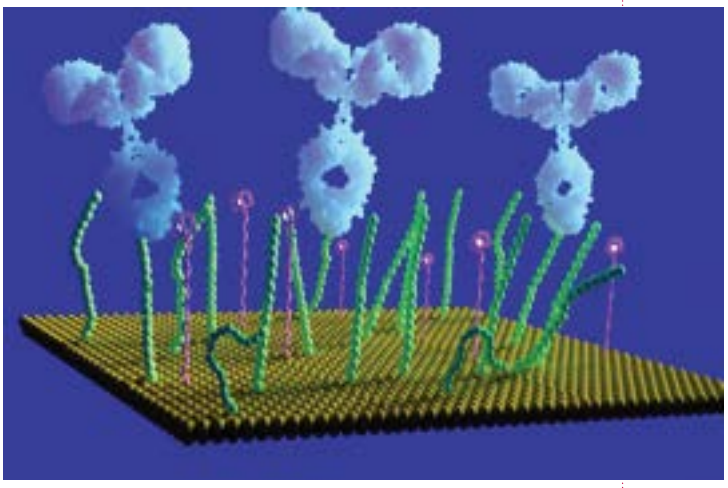
Oxford Impedance Diagnostics – Changing Medical Diagnostics

New impedance technologies produced by a collaboration between the Universities of Oxford and São Paulo in Brazil will allow cheaper, faster and more sensitive medical diagnostics for diseases ranging from breast cancer to dengue fever and Parkinson's Disease.



Over the last five years, researchers at the University of Oxford have developed new impedance technologies which have the potential to change diagnostic pathways for many diseases, reducing healthcare costs while improving patient outcomes.



Oxford Impedance Diagnostics is the company marketing these news tests, which will change the way medicine is delivered over the next ten years.

The core technology is based upon micro electrical impedance and it enables the development of assays with a unique combination of sensitivity, low cost, speed, convenience and multiplexing.

Professor Jason Davis at the University of Oxford is one of the co-inventors of the technology, and the expertise of his research group allows the development of tests for new biomarkers within six to eight weeks.

This will enable the company to quickly develop collaborations with academic groups and pharmaceutical companies seeking new companion diagnostics or improved assay performance for existing biomarkers.

In parallel, the company will also develop three of its own assays for Parkinson's disease, breast cancer and dengue fever. These tests will validate the platform capability, and once launched, offer significant revenue streams.

The proprietary platform technology at the heart of Oxford Impedance Diagnostics is based upon high-quality, peer-reviewed research by Professor Jason Davis and his group at the University of Oxford and Professor Paulo Bueno at the University of Sao Paulo in Brazil.

The technology is protected by five strong patents owned by Oxford University and licensed exclusively to the company.

Professors Davis and Bueno are the co-inventors of the technology, and along with the University of Oxford, they will also be the co-owners of the company.

External investment has already been secured, and it will help transfer the research platform into a commercially viable, high volume and robust assay system for use in clinical laboratories or at the point of care.

The combination of rapid assay development, multiplex capability, exceptional sensitivity and very low cost has the potential to disrupt the current diagnostic patient pathways for many diseases, reduce healthcare costs and improve patient outcomes.

Mr Andy Anderson
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Professor Paulo Bueno
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Professor Jason Davis
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Virtual Reality Can Help Treat Severe Paranoia

By combining evidence-based psychological treatment techniques with state-of-the-art virtual reality simulations, we were able to bring about a significant reduction in paranoid symptoms in patients, after a short 30 minute session.

About 1-2% of the population has severe paranoia, typically as a central feature of mental health disorders such as schizophrenia. Patients show extreme mistrust of other people, believing that others are deliberately trying to harm them. The condition can be so debilitating that sufferers may be unable to leave the house.

Coping mechanisms such as avoiding social situations, reducing eye contact or making any social interaction as short as possible worsen the situation, since they reinforce paranoid fears: patients come to believe that they avoided harm because they used these 'defence behaviours'.

By getting patients to drop these defence behaviours in a virtual reality simulation, Professor Daniel Freeman's team at Oxford University's Department of Psychiatry was able to get patients to 're-learn' that situations they feared were safe.

After the virtual reality therapy sessions, over 50% of these patients no longer had severe paranoia at the end of the testing day. The benefits also carried over into real-world situations, such as going to the local shop.

We are currently testing how long-lasting these benefits are, and how well they transfer to real-world situations.

These results demonstrate that our custom-build virtual reality system is an effective way of treating patients with otherwise difficult-to-treat conditions, such as paranoia.

Dr James Groves
Technology Transfer Manager
Oxford University Innovation
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Professor Daniel Freeman
NIHR Research Professor in Clinical Psychology
Consultant Clinical Psychologist
University of Oxford
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The Out of Hospital Emergency Multidisciplinary Unit

Meeting the healthcare demands of our population both now and in the future will need a new approach to crisis presentation. The Future Hospital Commission report, the NHS Five Year Forward View and the Primary Care Workforce Commission, all call for greater integration between primary and secondary care and an 'ambulatory by default' approach in acute medicine.

The Emergency Multidisciplinary unit in Oxfordshire delivers comprehensive assessment and treatment of acute medical illness in a community setting for older patients living with frailty (cognitive, social and physical). It provides acute ambulatory care where appropriate to patients who would otherwise be referred to an acute hospital site and therefore delivers care in a setting closer to their home or care home.

Patients can be referred from their general practitioner/family physician or from paramedics from the ambulance service for an escalation of care.

Rapid assessment from multiple healthcare disciplines (nursing, medicine, physiotherapy, occupational therapy, social care) provides comprehensive care delivery to address the multiple dimensions of need in this complex patient group. Clinical decision making is underpinned in this 'out of hospital' setting with point of care (POC) diagnostic testing. A range of biochemical tests with results available within minutes can detect acute kidney injury, electrolyte disturbance, acid-base disorders, coagulopathy, myocardial damage, infection and anaemia.

The central hospital laboratory service provides quality assurance and stock control to ensure seamless delivery of POC testing and additional connectivity transmits all POC results back to the laboratory database. As a result there is a continuous electronic record of all blood results for patients in the population wherever they seek healthcare, which allows for comparison of results at any subsequent healthcare attendance to determine stability, deterioration or recovery.

A full range of parenteral medical treatments can be given, guided by POC tests and where necessary cross-sectional imaging arranged at the local acute trust. Over 60% of patients (with a median age of 80) are managed on a purely ambulatory path without needing a hospital bed at any point during the month after initial assessment on EMU. The EMU won the inaugural Guardian Healthcare Innovation Award for Service Delivery in 2013.

Professor Daniel Lasserson
Clinical Lead for Diagnostics & Pathways,
Wealth Creation Programme, Oxford AHSN
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Wireless Assessment of Surgical Performance

Through an exciting collaboration between the Nuffield Department of Orthopaedics, Rheumatology & Musculoskeletal Science, and McLaren Applied Technologies, we have developed a novel wireless method for assessing surgical performance in both operating theatres and surgical skills training centres.

The burden of orthopaedic and musculoskeletal disease is a major problem worldwide. In the UK alone orthopaedic operations are the most frequent in any hospital. Besides joint replacements, arthroscopic (keyhole) surgery has also expanded significantly in the last decade. Skilled and competent surgeons are needed and the acquisition of technical skills remains a fundamental goal of surgical training. However, training has been restructured and there are now restrictions on trainees' working hours, particularly in Europe and North America, that have resulted in a huge reduction in the average number of operative cases per trainee. This reduction is an alarming 80% in the United Kingdom.

While surgical competence consists of a complex combination of technical dexterity, knowledge, decision-making, and communication skills, technical dexterity remains particularly important and underperformance in this domain leads to poorer results. Greater peer and public scrutiny means that improving surgical learning and demonstrating competency is evermore important.

We have previously validated methods of assessing surgical dexterity, studied the learning curves of some procedures, and demonstrated the value of surgical skills simulators. Through our exciting collaboration with McLaren Applied Technologies we have now developed a novel 'wireless' objective surgical dexterity assessment tool that not only assesses surgical dexterity in a simulated setting, but for the first time in the real operating theatre. This wireless elbow-worn motion sensors system now allows for feasible objective assessment of surgical performance. In turn, this is facilitating a programme of surgical simulation and patient outcome research in Oxford that will ultimately improve the delivery of surgical treatments and improve patient outcomes in orthopaedics.

UNIVERSITY OF OXFORD

McLaren APPLIED TECHNOLOGIES

Professor Jonathan Rees
Orthopaedic Surgery and Musculoskeletal Science
University of Oxford
Collaborating with Dr Caroline Hargrove
and Dr Georgina Kirby at McLaren.

Pro-Mapp
Software for Managing Orthopaedic Care Pathway

Pro-Mapp is a software enabled system for orthopaedic care pathway management, implant safety monitoring, and patient reported outcome delivery.

Pro-Mapp is a new spinout venture originating from research collaboration between Oxford University researchers and expert health care software collaborators, Fr3dom Limited. It is currently seeking first round investment of $900,000 to be followed with $2-4m in 9 to 12 months' time, and a third round likely at 3 years.

Pro-Mapp is a software enabled system for orthopaedic care pathway management, implant safety monitoring, and patient reported outcome delivery. The orthopaedic implant industry is worth over $6bn per year and the founding board members include world leading clinicians and academics.

There are three initial revenue and business channels:

- Joint Access is a clinical pathway system that uses patient reported outcome measures (PROMS) intelligently to support clinical pathway management of hip, knee and shoulder procedures.

- SSAFE is a long term surveillance system that allows large scale post-operative surveillance at a cost previously inaccessible to implant manufacturers.
- Fr3PROMS is a tool that can be used to distribute, monetise if necessary, and present PROM tools and shared decision making tools (SDMs) digitally. It does not own or create content, but is a delivery system. Fr3proms already carries content for all mandated procedures in England as well as a large number of tools for other organisations including the Kettering Cancer Centre, New York and iOutcomes for the Oxford Scores.

Revenue will be generated through sales of SSAFE and Joint Access to manufacturers and large hospitals, clinics and high volume surgeons. Fr3proms is distributed and bought online, giving immediate market accessibility. Users of Fr3proms may upgrade to Joint Access on the unified software platform. This is further enhanced by the links with SSAFE allowing primary, secondary and follow up care to access the same information when a patient is consented.

The platform is now fully developed and ready for field testing and scale up in different environments and countries. Customers already include Zimmer, Biomet (SSAFE), Oxford University Hospitals (Joint Access) NHS Scotland and SITU the surgical trials unit at Oxford.

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Working Towards a Personalised Surgical Pathway

In collaboration with McLaren Applied Technologies, University of Oxford researchers are working to improve patient preparation and flow through the surgical pathway, improving both surgery outcomes and patient experience. Researchers are developing a system of remote monitoring and personalised patient feedback that can be integrated into the care of surgical patients, improving the care provided.

On average, a person will have four operations in their lifetime. The pathway from initial contact through to the postoperative recovery period is complex and can be confusing.

Many factors along the pathway will affect patient experience and outcomes, but most current research has only focused on improving the 'hands on' care provided by doctors to patients in hospitals.

Our research will investigate ways of using innovative technology to involve patients in their entire surgical pathway, in order to provide better care.

We have used commercially available wearable remote activity monitoring technology to assess patient' fitness levels before and after an operation, adding value to the care of surgical patients in the NHS.

Our findings will help keep doctors better informed of a patient's health status, and help patients to optimise their health before an operation.

The project aims to use a new patient pathway, supported by innovative patient monitoring methods and software design to achieve:

- Patient Centred Care

– Empowering patients with timely and relevant information about their operation so they feel fully prepared

– Enable patients to control and update their own medical information and alert their doctors of any problems

– Improve communication between the patient, GP and the hospital before an operation to avoid delays and errors in patient care

- Personalised Care

– Individual monitoring of patients at home before their operation using wearable technology to give detailed patient profiles

– Ability to build an accurate patient profile and therefore target areas needing intervention well in advance of the operation

– Providing personalised feedback on the patient's health status and advice on how to optimise their health before their operation

– An app that helps patients to understand their test results and medication changes before their operation.

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UKPDS OM version 2:
a Type 2 Diabetes Outcomes Model

The UK Prospective Diabetes Study (UKPDS) outcome model uses 89,760 patient-years of data to estimate life expectancy and cumulative costs of complications in people with Type 2 Diabetes.

Type 2 diabetes is estimated to affect 9% of adults, and it costs $465 billion each year. With these figures predicted to rise by 50% over the next 20 years, providing Type 2 Diabetes care represents a major economic challenge for the healthcare industry.

Because of the extended timeframe over which the multiple outcomes associated with Type 2 Diabetes unfold, stakeholders frequently make use of health economic models to support evidence-based decision making related to funding allocation.

The Oxford UKPDS Outcomes Model is a computerised simulation tool designed to estimate life expectancy, quality adjusted life expectancy and the cumulative costs of complications in people with Type 2 Diabetes.

The newly released version 2 makes use of data from all 5,102 UKPDS patients who entered the trial, as well as the 4,031 survivors who entered the 10 year post-trial monitoring period. This equates to 89,760 patient-years of data, which is double the number of events in version 1.

Key new features in version 2 include:

- Additional risk factors: Albuminuria, Heart rate, WBC, Haemoglobin and eGFR
- Additional clinical events: Diabetic ulcer and CVD death
- New equations predict second events for MI, Stroke and amputation
- Supports up to 3 groups of patients in a single run and provides a summary for each group as well as group differences
- Cost / utility values can now be varied by age and sex
- Addition of therapy costs and pre and post complication costs
- Calculation of Monte Carlo Error allows simulation fine-tuning
- Can queue workbooks to run multiple unattended simulations, while parallel processing can take full advantage of up to 10 computer cores

The UKPDS Outcomes Model has already been adopted by a range of companies, government bodies and Universities, including the UK's National Institute of Health and Care Excellence (NICE) and four out of five largest diabetes drug manufacturers.

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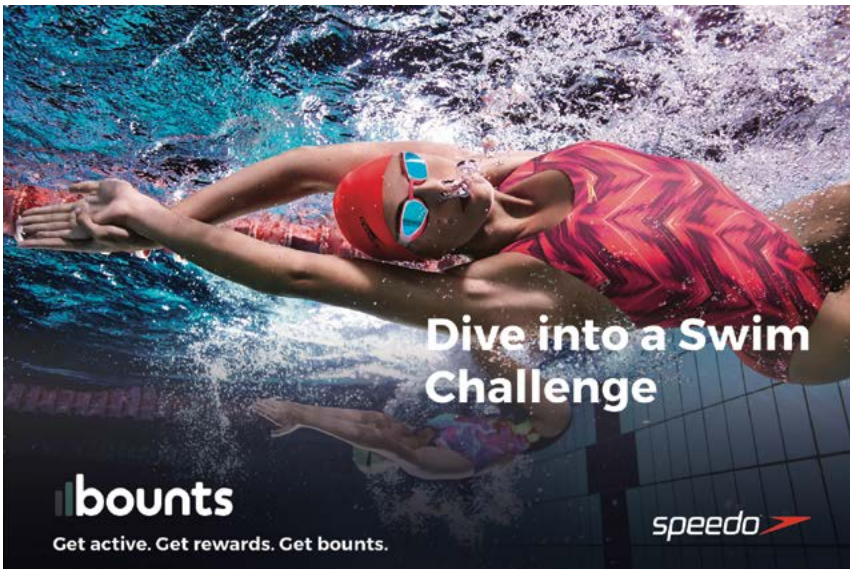
bounts
Incentives to Get Active

bounts is a profitable, fast growing, lifestyle rewards company turning healthy activity into habit. Over 3 million members and growing rapidly in the UK (#1 Health & Fitness App in Jan 2016).

bounts is a profitable, fast growing, lifestyle rewards company which turns healthy activity into habit.

Founded in 2011 with backing from Oxford University Innovation's Startup Incubator, bounts was ranked #1 Health & Fitness App in Jan 2016.

With over 3 million members, bounts is growing rapidly in the UK and has a reward shop that covers the UK, USA, Canada, India, and UAE. The free and innovative bounts app (iOS and Android) rewards members for being active. Once signed-up, members connect it to a fitness tracker and exercise to earn points; the points can then be redeemed for high street vouchers. The more active they are, the more points they earn.



Providing rewards and incentives is an effective strategy to increase physical activity and improve health behaviours in a variety of settings. The evidence suggests that incentives on their own or in combination with other strategies can significantly increase physical activity, lead to improvement in health and weight management.

The bounts Team

Participation levels are found to be 30 per cent higher in people using a fitness reward system, and a recent study revealed that bounts members are twice as likely as non-members to keep using their gym membership for a period of 12 months or longer.

Oxford University Index of Multiple Deprivation (IMD) tool provided highly insightful data about bounts members:

- 34% are from the 2 most deprived quintiles (Q4 and Q5)
- 31% who paid for themselves to upgrade to Premium+ (£14.99) were from Q4 and Q5
- 29% of our top 500 members (based upon current points balance) are from the 2 most deprived quintiles

bounts members are reward driven, focussed on the collection of points (through various forms of exercise) in order to achieve a reward. They range in age from 8-87 with the key age groups being 25-34, 35-44, and 15–25, with over 60% being female.

bounts is a natural fit for sports operators, gyms, national governing bodies, and organisations seeking insight into usage data and to improve retention rates.

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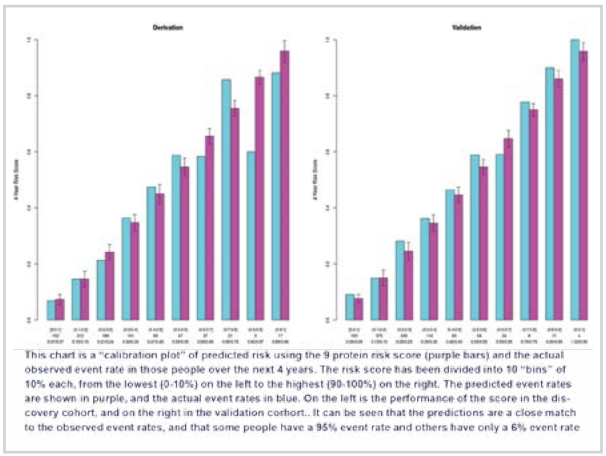
Precision Risk Profiling in Heart Disease and Stroke for Tailored Care and Health Behaviour Advice

Cardiovascular disease is the UK's biggest killer but existing risk scores are imprecise and inaccurate; perhaps because of this, most people don't reliably take their medicines or change their lifestyles effectively. This project is to develop and implement within the NHS a protein-based risk profile that enables care teams to individualise interventions and motivates patients to improve lifestyles.

People with known coronary heart disease are all told they are at high risk but not everyone is the same. We describe how measuring thousands of proteins using modified DNA-based reagents has led to the ability to discover signatures for risk which can discriminate between people who otherwise look similar, but some have a 9 in 10 chance of death or hospitalisation within 4 years, and others with only a 1 in 20 chance.

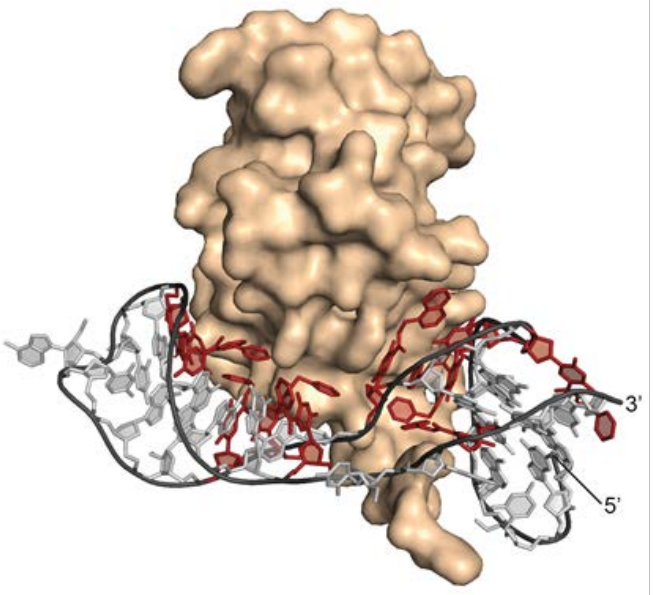


This chart is a "calibration plot" of predicted risk using the 9 protein risk score (purple bars) and the actual observed event rate in those people over the next 4 years. The risk score has been divided into 10 "bins" of 10% each, from the lowest (0-10%) on the left to the highest (90-100%) on the right. The predicted event rates are shown in purple, and the actual event rates in blue. On the left is the performance of the score in the discovery cohort, and on the right in the validation corhort.. It can be seen that the predictions are a close match to the observed event rates, and that some people have a 95% event rate and others have only a 6% event rate

We made 2.7 million individual measurements in plasma from ~1800 people with apparently stable heart disease to discover the optimal combination of proteins to predict poor outcomes such as death, heart attack, heart failure and stroke over the 1-5 years after their blood sample. We used mathematical machine learning techniques to finalise an algorithm that used 9 proteins, and then applied it to an independent validation set. When the population is ranked for risk using this score, the actual observed event rate in the top 20% is >10 fold higher than that in the bottom 20%. This is better than any combination of traditional markers, demographics or known risk factors.

Now the project has evolved into planning, with the Oxford AHSN, the early implementation of this product within the NHS in this region. The development of an individualised and accurate prediction is only the first step towards improved outcomes and reduced costs. Can the score be used to direct more medical resources towards the most needy?

Can and will patients improve their lifestyles and nutrition with a less deniable and frighteningly accurate prediction? Will the monitoring of within-person changes in risk help? Can the medical care teams tailor interventions based on individualised risk? Those are the key questions that the prospective early implementation program will seek to address.



The picture above is a DNA-based reagent (a SOMAmer or Show, Off-rate Modified Aptamer) binding to a protein commonly found in the blood. Thousands of these reagents are used together to measure thousands of proteins in the blood simultaneously.

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Islet Cell Transplantation for Type 1 Diabetes – Current Status and Future Opportunities

Islet cell transplantation has achieved considerable clinical success in adults over the past two decades. However, the ultimate aim of using it to treat children soon after diagnosis is yet to be realised.

Pancreatic Islet cell transplantation is a state-of-the-art, minimally invasive treatment that has the potential to reverse type 1 diabetes mellitus. Over the past two decades, the clinical outcomes of this procedure have improved dramatically, with up to 80% of selected adult patients now achieving insulin independence for at least one year post transplantation in clinical trial

Oxford DRWF Human Islet Isolation Facility

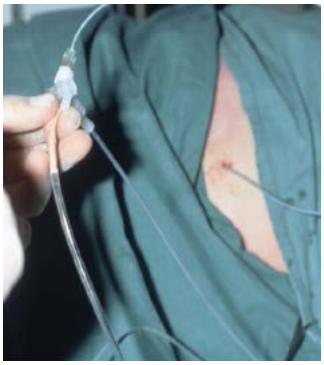
That said, the ultimate goal for this treatment is to be able to transplant children soon after diagnosis. For this to be achieved, a number of challenges still need to be overcome, the main one being to develop strategies that prevent the need for long-term immunosuppression with its associated risks.

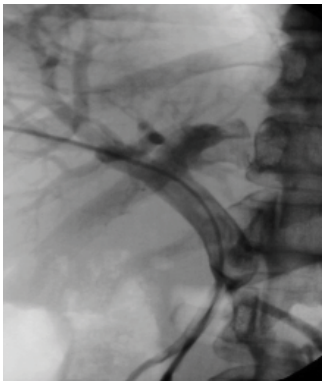
Purified Islets

One of the approaches is to develop implantable macro-encapsulation devices that isolate the islets from the immune system, but that still allow the islets to secrete the pancreatic hormones including insulin and for them to accurately detect subtle fluctuations in blood glucose.

Oxford has been at the forefront of the field of islet transplantation for many years. We have one of only three commissioned clinical isolation facilities in the UK and are one of a few commissioned supra-regional islet transplant centres.

Dovetailed with this clinical programme is our collaborative, multi-disciplinary research programme, which includes paediatric transplant surgeons, islet biologists, transplant immunologists, tissue engineers, and industrial partners.





Islet Transplant

Immunoisolation and islet macro-encapsulation are major foci of the translational research programme and Oxford has been chosen as one of two European centres to conduct 'first in man' trials of a novel macroencapsulation device. This talk will outline the current status of islet transplantation and address some of the ongoing challenges. It will then focus on immunoisolation and pancreaticomimetic bioscaffolds.

DIABETES RESEARCH WELLNESS FOUNDATION™

Professor Paul Johnson
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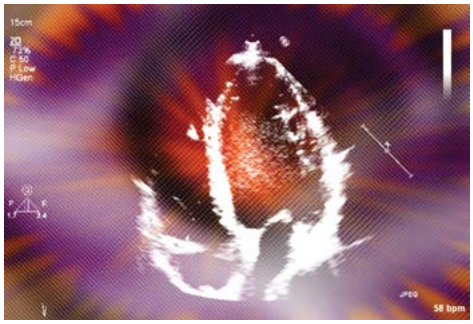
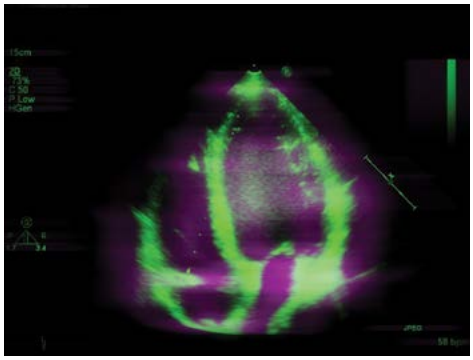
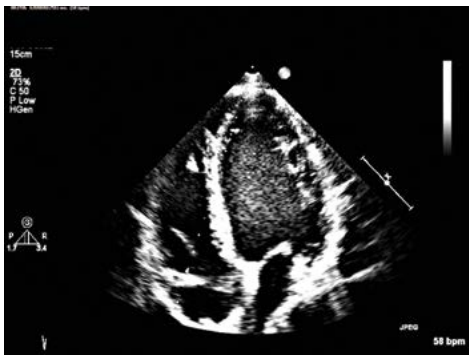
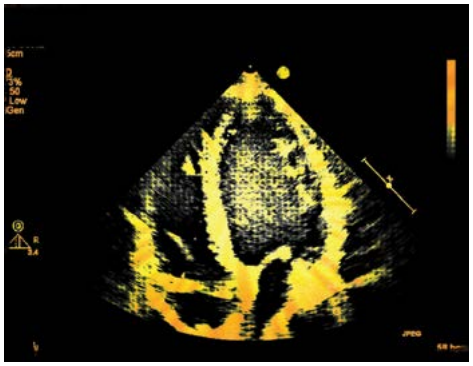
ULTROMICS
- Advanced Ultrasound Analysis Made Simple

By simplifying the way echocardiographers and doctors are able to extract complex information from echocardiograms, we can increase their confidence in image interpretation.









If a doctor wants to look at the structure or function of your heart, the first test they request is an echocardiogram. Thousands are performed, in every hospital, every year.

Ultrasound images are rich in detail but, because of the time taken to extract quantitative data from the images, most of this detail is ignored: diagnosis is instead based on visual assessment, supported by a minimal set of measurements.

Simple ways to extract the complex information contained in ultrasound images are therefore needed.

We have developed such techniques and compared the information we extract against reference datasets of large numbers of people with known diseases.

The measures appear to have the potential to identify a range of heart problems. Placing the techniques into clinical practice should therefore help technicians and doctors reach clinical decisions faster and with greater confidence.

The first, proven application of the system is in stress echocardiography. This is a test, performed widely within the NHS, to decide the significance of chest pain symptoms in different patients. It notoriously requires a Consultant Cardiologist to supervise the test, having developed specific skills in visual interpretation of a series of images collected at rest and after stress.

We have shown that, with a simple data extraction from stored images, the tool works as well as the Consultant Cardiologist: it can even identify some tests that were incorrectly classified by the doctor.

We have also been able to adapt the methods to work on large, stored, echocardiogram archives. As the process is relatively simple, we can now quickly re-evaluate datasets from pharmaceutical clinical trials, academic research groups or clinical departments. Retrospective, re-examination of studies using the complex image analysis metrics captured by the technique, has the potential to provide a 'second look' at a drug or clinical research finding.

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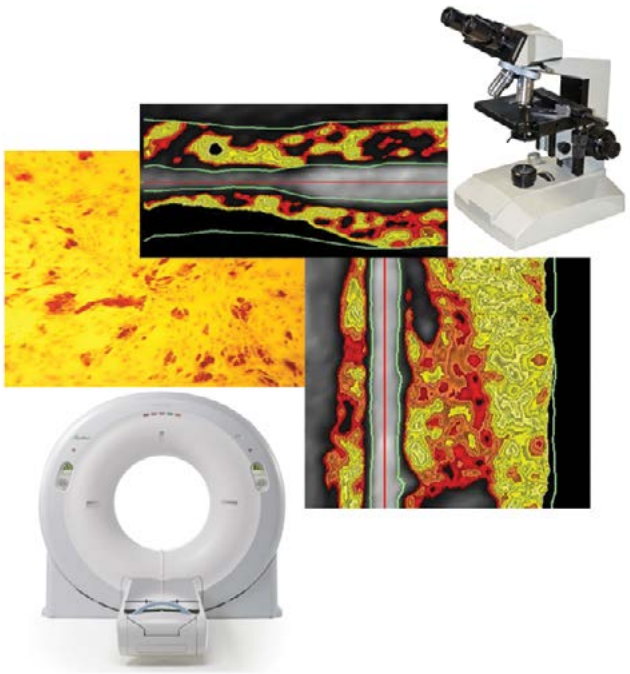
Inflammation Quantification for Cardiovascular Disease Risk Characterisation

An unconventional method uses common computerised tomography to detect vascular inflammation by tracking changes in the perivascular fat.

Coronary artery disease (CAD) is the most frequent cause of death in industrialised nations and it is responsible for billions of pounds of healthcare spending annually: in the EU alone, £169 billion is spent every year dealing with CAD.

The first sign of the disease in roughly 50% of men and 64% of women is a heart attack or death. There is therefore significant value in identifying apparently healthy individuals with 'at-risk' pathology.

Following our landmark discovery that inflammation in the coronary artery (the major driver of CAD development and subsequent heart attacks) drives changes in the surrounding fat, we have developed a non-invasive method for quantifying inflammation in the coronary artery.



The method uses coronary computerised tomography (CT) to estimate the changes in the size of fat cells around the arterial wall.

These changes are expressed as a single index, (the 'Fat Attenuation Index, (FAI), which provides an estimate of site-specific coronary inflammation. Non-invasive detection of vascular inflammation is the 'holy grail' of cardiovascular medicine, as it will significantly affect clinical practice by allowing early cardiovascular risk stratification of the population and deployment of therapeutic strategies to prevent CAD and heart attacks.

Currently protected by a patent application, our method offers major advantages over existing approaches for the diagnosis of vascular inflammation.

Following very positive commercial feedback, a multidisciplinary team funded by the UCSF scheme and led by Professor Antoniades, Professor Channon (both at the Division of Cardiovascular Medicine, Radcliffe Department of Medicine) and Professor Noble (Oxford Institute of Biomedical Engineering) is currently working on developing a stand-alone, automated and user-friendly software.

This will increase the commercial value and attractiveness of the method and allow further validation in large-scale clinical studies. Overall, we believe that the current method has the potential to deliver both health and wealth and revolutionise the ever-expanding market of non-invasive cardiovascular imaging.

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System for Electronic Notification and Documentation (SEND)

Using in-house IT resources alongside human factors, engineering, and clinical expertise from the University of Oxford, the Oxford University Hospitals Foundation Trust (OUH) has developed bespoke 'early warning' software that integrates with the electronic patient record.

Recognising the limitations of a paper-based approach to routine vital signs recording, OUH determined that an electronic solution could further improve patient safety. The team, which includes members from both the OUH Trust and the University of Oxford, has designed an electronic early warning system to help clinical staff make the best decisions for their patients.

Patient notes could previously only be reviewed in one location. SEND now allows multi-disciplinary teams to access the information they need from different places within the Trust.

This avoids medics noting readings on a piece of paper to transcribe to charts later, thus avoiding transcription errors. Any errors on the electronic record can be corrected immediately.

SEND also automatically calculates the 'trigger' score for each patient, and offers clinical decision support through links to hospital escalation protocols, and real-time audits that facilitate clinical governance processes.

The easy-to-use interface uses human factors expertise that fits the task to the human, so that systems flow intuitively. The tablet expects inputs in the same order that staff work, saving around three minutes per observations set. Staff are able to use this extra time to complete other patient care tasks.

The team is now looking to take the principles of SEND further. HAVEN, a new research project funded by the Department of Health and Wellcome Trust Health Innovation Challenge Fund, will test the process of issuing alerts using algorithms that monitor not just vital signs but blood tests results, demographic information and medication.

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SEND team, including project leader Dr Peter Watkinson at centre, back row.

Novel Small Molecules to Treat Familial High Cholesterol Levels

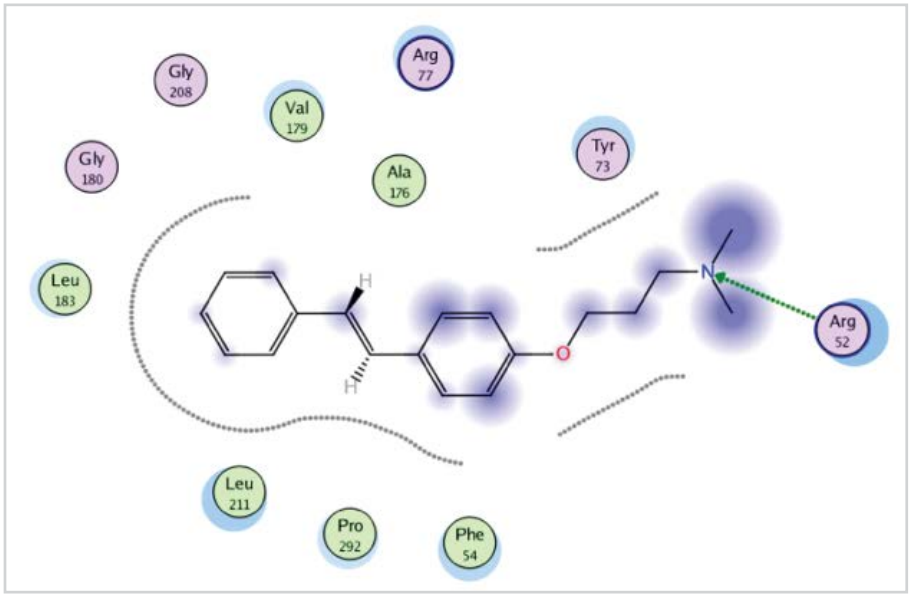
Novel small molecules that inhibit the formation of cholesterol might help lower 'bad' cholesterol in patients who otherwise have difficulty in reducing their cholesterol levels sufficiently.

High cholesterol blood levels (hypercholesterolaemia) are one of the leading factors for the development of cardiovascular disease.

While using a statin to lower low density lipoprotein (LDL)-cholesterol can reduce the risk of a cardiovascular event by ~30%, some patient populations are unable to sufficiently lower their LDL-cholesterol.

This is especially true for patients with familial hypercholesterolaemia, whose high levels of LDL-cholesterol are the result of a genetic disorder.

Lowering LDL-cholesterol in these patients may require the production of more Low-Density Lipoprotein Receptors (LDLRs), on top of what maximal dose statins are capable of. LDLRs are cell-surface receptors which recognise and help in the removal of LDL-cholesterol.



In silico modelling of Compound 15a binding in the active site of the enzyme Squalene Synthase

We have used a compound screen to identify a novel series of small molecules which can upregulate LDLRs in mouse and human liver cell lines, even at nano-molar potencies (EC50: 39nM). Structure-activity relationship studies carried out on the lead compound (Compound 15a) lead to the identification of Compound 40, which has improved potency (EC50: 28nM) and pharmacokinetic profile.

Compound 40 and 15a were found to inhibit squalene synthase, the first committed step in the formation of cholesterol in the body. When combined with statins in a test-tube, these squalene synthase inhibitors increase LDLR expression more than either class of drug alone can achieve.

These small molecules could therefore be useful in treating patients that require further lipid lowering to reach a desired cholesterol goal.

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