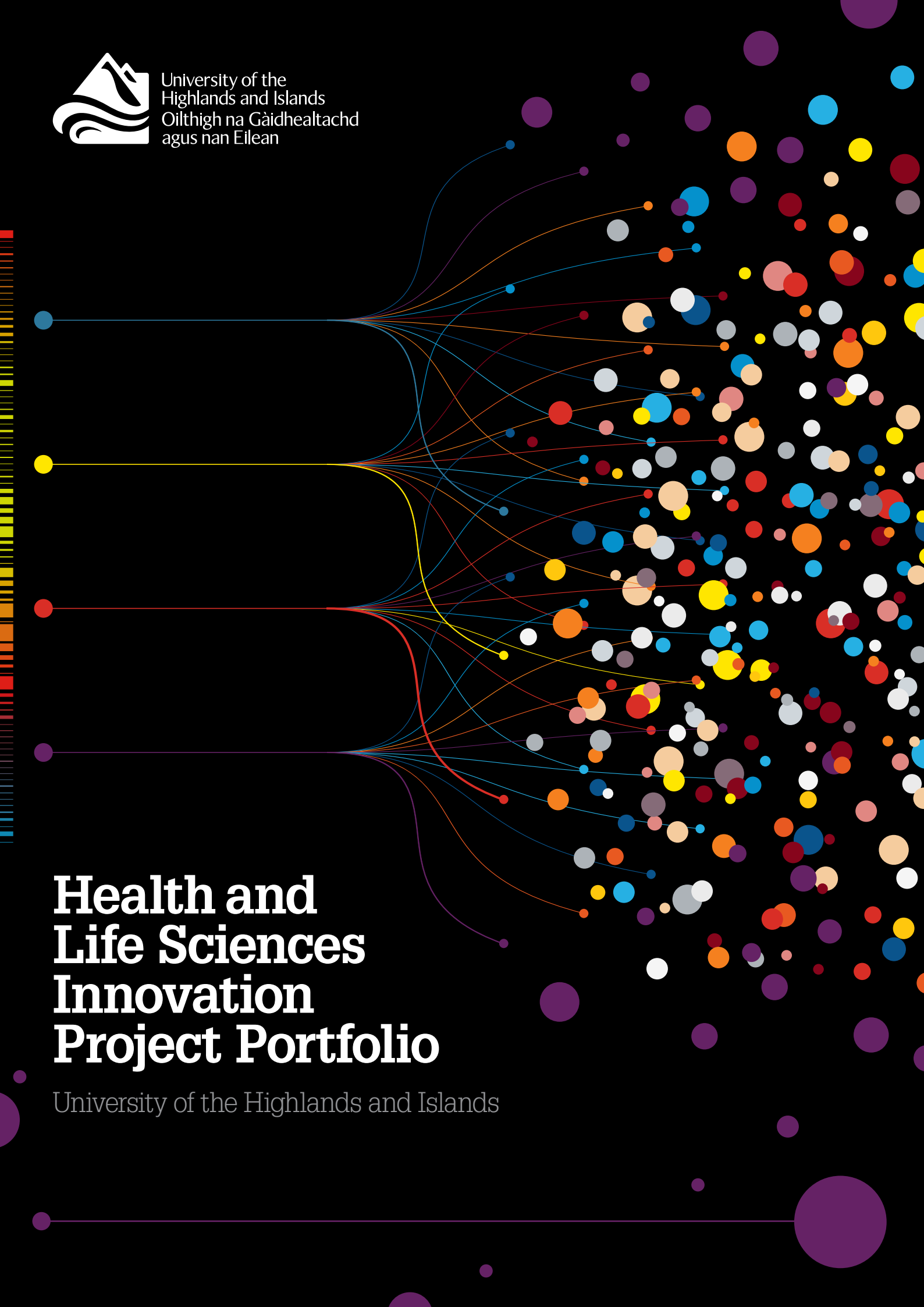
University of the Highlands and Islands
Oilthigh na Gàidhealtachd agus nan Eilean



Health and Life Sciences Innovation Project Portfolio

University of the Highlands and Islands

CONTENTS

We support innovation, development and implementation of health and life science technologies, products and services with local significance and global relevance.

INTRODUCTION

We are delighted to provide this portfolio of innovative health and life science projects supported through the Inverness and Highland City-Region Deal.

The Highlands and Islands face major challenges in delivering affordable, safe and effective care to a population with increasingly complex medical needs. To address this, the £315 million Inverness and Highland City-Region Deal, jointly funded by the UK and Scottish governments and the Highland Council and its partners, has committed £9 million in funding towards health and life science research and innovation at the University of the Highlands and Islands.

The university has adopted a strategic approach to supporting health and life science projects with both local significance and global relevance. Major themes include facilitating the movement of patients from hospital to home, increasing patient engagement by addressing holistic care needs and promoting disease prevention through adopting a healthy lifestyle. Projects are linked to our regional demography and geography and focus on existing university strengths in active health, proteomics and lipidomics, behaviour science, and rural health and wellbeing. A key aim is to expand the range and scope of the regional life sciences sector by providing the infrastructure and personnel to improve care provision, secure inward investment and create new education and employment opportunities.

We are working with our partners to innovate, develop and implement new health and life science technologies, products, services and businesses. Highlights include successful clinical, commercial and academic collaborations, new healthcare and life science products and services, and clinical service delivery improvements. In 2021, we will open a new innovation laboratory to support commercially relevant health and life sciences projects. This open innovation facility will be highly accessible and play a significant role in delivering health and life science opportunities throughout the North of Scotland.

If you would like more information about our work, please email **innovation@uhi.ac.uk**.

Dr Adam Giangreco
Director of Innovation and Commercialisation

Professor Ian Megson
Head, Institute of Health Research and Innovation

The Highlands and Islands have a long history of health and life science innovation spanning more than 100 years.

1913
Launch of the Highlands and Islands medical service, forerunner to today's NHS.

1965
Establishment of the Highlands and Islands Development Board (now Highlands and Islands Enterprise). Today HIE continues to serve as a key partner for regional life science innovation.

1995
Founding of Inverness Medical, global leader in diabetes monitoring (now LifeScan).

2001
University of the Highlands and Islands is awarded higher education institution status, enabling increased academic-commercial partnerships.

City Region Deal
Cùmhnant Baile-Roinne

2007
Opening of the Centre for Health Science in Inverness. The Centre is home to the Institute of Health Research and Innovation as well as numerous life science companies.

2017
Funding from the UK Government as part of the Inverness and Highland City-Region Deal enables new clinical, academic and commercial partnerships in healthcare and life sciences.

2021
Planned completion of the Inverness Campus health innovation laboratories. These will provide a resource for clinical, academic and commercial partners to develop innovative new technologies in health and life science.

HIGHLIGHTS

- £9m Inverness and Highland City-Region Deal funding committed from the UK Government to support support health and life science innovation
- 85 current and in development health and life science projects
- More than 1200m² dedicated health and life sciences laboratories
- 5 ongoing commercial partnerships with UK and international companies

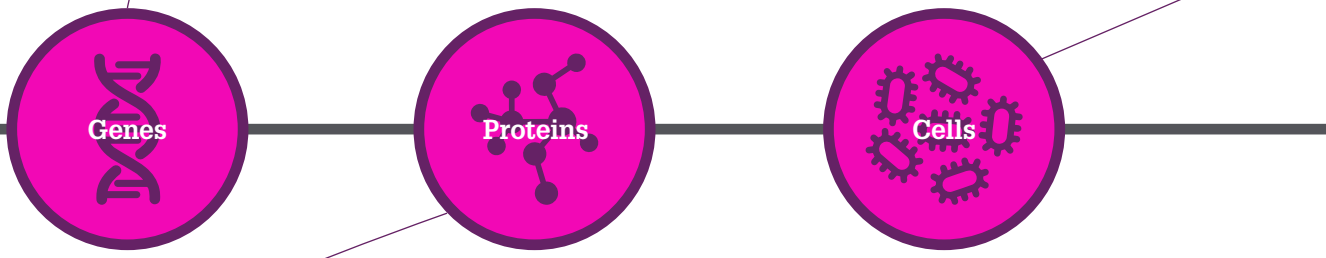

14
£30m
69%
50+
14 collaborations with universities across the globe
69% of University of the Highlands and Islands health research deemed internationally excellent or world leading (2014 UK REF)
£30m in new research grant income generated since 2015
More than 50 research active academics and clinicians

Health and life science research covers a range of disciplines that impact human health, from genes through to environment and infrastructure.

MOLECULAR GENETICS

Dr Antonia Pritchard

Antonia studies the genetics, genomics and immunological response to diseases such as cancer. She helps understand which changes in DNA make people more likely to develop these conditions, how genetics and genomics can help predict who is at risk, and identify whether these changes influence immune responses and treatment outcomes.



PROTEOMICS AND LIPIDOMICS

Prof Phil Whitfield and Dr Mary Doherty

Phil and Mary lead a team of researchers who are employing mass spectrometry to investigate the composition and function of proteins and lipids. Their work is focussed on applying this lipidomic and proteomic analysis towards biomedical questions relevant to human conditions such as diabetes and cardiovascular disease.

FREE RADICAL BIOLOGY

Prof Ian Megson

Ian's interests include the interaction of free radicals, nitric oxide and oxidant species in the cellular processes that underlie heart disease and other conditions. His work is focused on the role and potential benefits of nitric oxide donor drugs as vasodilators, anti-platelet agents and anti-inflammatory agents.

Organ Systems | People | Networks | Environment & Infrastructure

REMOTE AND RURAL HEALTH

Prof Annetta Smith and Prof Sandra MacRury

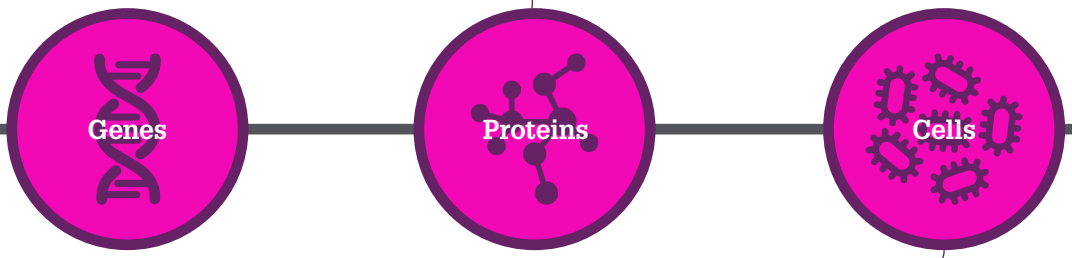
Sandra and Annetta's remote and rural health interests include delivering world class patient access, experience, and clinical outcomes throughout the Highlands and Islands. Work is focused on understanding how interactions amongst users, healthcare professionals and existing and emergent technologies can impact chronic diseases such as diabetes.

RESEARCH STRENGTHS

NOVEL BIOCHEMISTRY

Dr James Cobley

James studies redox biochemistry and has an interest in how the production and metabolism of mitochondrial reactive oxygen species like superoxide and hydrogen peroxide impact development. James is applying this work towards developing new tools for the diagnosis and treatment of human disease.



PRECISION IMMUNOLOGY

Prof Jun Wei

Jun investigates the immunogenetic mechanisms of human diseases, with a focus on schizophrenia and cancer. His recent work has identified natural antibodies present in around 10% of individuals that can be isolated, purified and used as a precision diagnostic and therapy for certain types of liver cancer.

BEHAVIOUR SCIENCE

Prof Gill Hubbard

Gill is interested in behaviour change to improve health. Her expertise is the design, implementation and evaluation of complex interventions, including feasibility, pilot and randomised control trials. Gill leads research programmes on teenage cancer education, rehabilitation and physical activity interventions, and remote and rural healthcare solutions.

Organ Systems | People | Networks | Environment & Infrastructure

ACTIVE HEALTH AND PHYSIOLOGY

Dr Dan Crabtree

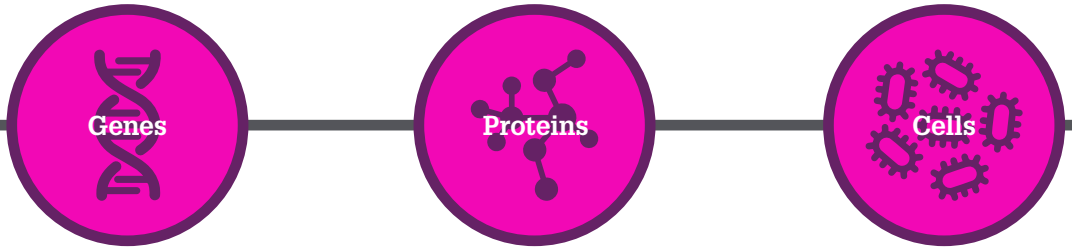
Dan examines the effects of dietary interventions and physical activity on human metabolic health. His main objective is to combine the university's existing research strengths with his own expertise in human nutrition and physical activity interventions to deliver novel healthcare innovations.

RESEARCH STRENGTHS

CLINICIAN-LED INNOVATION

Prof Steve Leslie, Mr James Beastall, Prof Angus Watson, Dr Beth Sage and Mr Raymond Oliphant

The university funds clinical secondments with NHS consultants to identify and address unmet clinical needs. These cover a broad range of disciplines including cardiology, endocrinology, respiratory medicine, orthopaedics and colorectal surgery. This novel partnership is transforming our approach to applied biomedical research.



USER-LED DESIGN

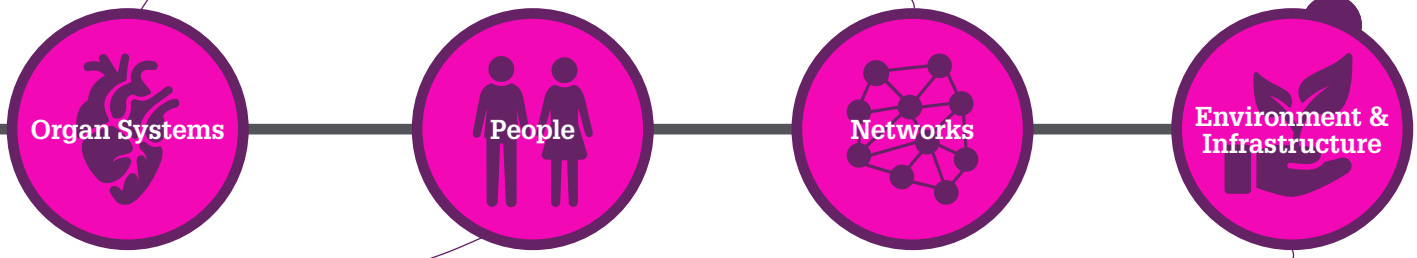
Dr Sarah-Anne Munoz

Sarah-Anne's research involves the use of participatory, qualitative methods to guide the co-production and user-led design of healthcare services and technologies. Her work particularly focuses on community engagement within remote and rural populations and the role of green and blue spaces in promoting health and wellbeing.

DIGITAL HEALTH

Dr Mark Grindle

Mark investigates the potential for digital health technologies to improve people's health and wellbeing. His focus is on the therapeutic power of digital, audio-visual and interactive storytelling to influence human behaviour towards positive outcomes and behaviour change.



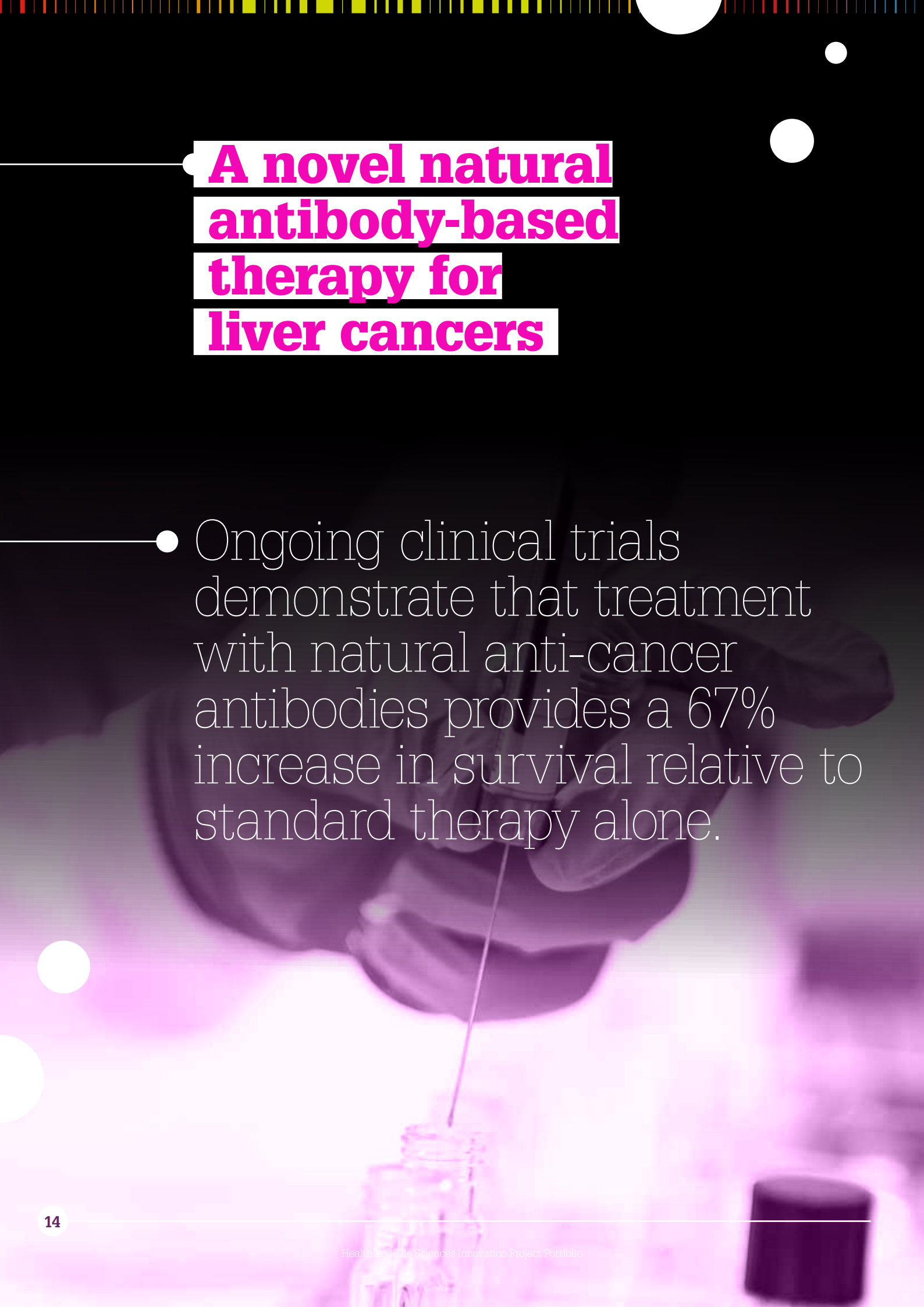
PHYSICAL ACTIVITY BEHAVIOUR

Prof Trish Gorely

Trish's interests are in psychological and behavioural aspects of physical activity, sedentary behaviour and health. Her work is focused on health outcomes, physical activity and sedentary behaviour measurement, understanding the correlates of these behaviours and the design and evaluation of behaviour change interventions.

A novel natural antibody-based therapy for liver cancers

Ongoing clinical trials demonstrate that treatment with natural anti-cancer antibodies provides a 67% increase in survival relative to standard therapy alone.



CASE STUDY

Innovation overview

Liver cancer is amongst the most common tumours worldwide, with approximately 800,000 new cases diagnosed each year. Most people are diagnosed with advanced disease, which typically carries a mere 9% five-year survival rate. There is an urgent need to identify new technologies to improve liver cancer treatment and improve patient outcomes.

University of the Highlands and Islands research recently identified a novel role for naturally occurring antibodies in treating liver and other cancers. Specifically, *in vitro* studies established that natural antibodies present in plasma isolated from healthy donors can deliver increased tumour killing activity.

This project will establish the clinical utility of screening anticancer antibodies in plasma and developing natural antibody-based therapies to treat advanced liver cancer. This involves screening healthy donor blood samples for the presence of natural anti-cancer antibodies. Once identified, samples with high levels of natural antibodies will be purified and pooled for use as a novel therapy in ongoing clinical trials taking place in China.

Objectives

- Perform large scale blood sample screening and plasma enrichment for natural anti-cancer antibodies.
- Secure intellectual property licenses to enable natural antibody clinical trials.
- Evaluate and publish results of these studies as appropriate.

Potential impacts and outcomes

This project has established a new type of cancer therapy based on the identification, purification and delivery of natural anti-cancer antibodies. Successful demonstration of this technology in ongoing trials would have significant clinical and economic implications.

City-Region Deal deliverables

New product/service: novel plasma-based cancer therapy.

External partner:

QHB Ltd.

University lead:

Prof Jun Wei,
Professor of Genetics and Immunology

Percutaneous coronary intervention monitoring to facilitate accelerated patient discharge

- Robust, clinically validated percutaneous coronary intervention discharge criteria could deliver significant time and cost savings.

CASE STUDY

Innovation overview

There are over 80,000 people undergoing percutaneous coronary intervention procedures in Britain each year. More than half of these patients are admitted overnight at an annual cost exceeding £20 million in the UK alone. The decision to admit these patients is largely dependent on physicians' 'gut feelings' and it is likely this number can be reduced through careful data analysis and triage.

This study will investigate the reasons for hospital admission in people undergoing percutaneous coronary intervention with the aim of discovering what characteristics define low versus high risk patients. We will integrate clinical and ECG data to generate an algorithm for patient risk profiling, enabling accelerated hospital discharge for low risk patients.

Objectives

- Assess the technical feasibility and ideal use scenarios for remote cardiac monitoring.
- Establish stratification protocols to identify an 'ideal patient profile' for the use of cardiac monitors in remote and rural settings.
- Develop a digital algorithm to enable the identification of patients suitable for accelerated hospital discharge.

Potential impacts and outcomes

Reduced hospital admission post percutaneous coronary intervention has the potential to improve patient experience, promote increased patient mobility and deliver significant cost savings. The algorithms that will be developed therefore represent a potentially valuable new commercial product.

City-Region Deal deliverables

Supported company for product innovation: TTP plc
New product/service: Digital algorithm for percutaneous coronary intervention monitoring.

External partner:

TTP plc

University lead:

Prof Steve Leslie,
Professor of Cardiology and Consultant Cardiologist (NHS Highland)

Validating decontamination systems to help reduce hospital-acquired infection

Hospital acquired infections following surgery impact over 250,000 patients and cost the NHS in excess of £1 billion each year.

CASE STUDY

Innovation overview

Ineffective decontamination of surgical instruments is considered a major cause of hospital-acquired infection which affects up to 10% of patients, is responsible for 5,000 deaths and costs the NHS in excess of £1 billion each year. Despite this, there is little data on the efficacy of decontamination systems and a lack of standardised validation practices. The need for independent, standardised monitoring is therefore essential to improve patient outcomes and reduce costs.

This proposal will compare novel Aseptium decontamination technologies and washing systems in use throughout the NHS. Researchers within the University of the Highlands and Islands will perform independent cleaning efficiency analysis to detect surgical contamination products using advanced instrumentation including liquid chromatography-tandem mass spectrometry.

Objectives

- Comparison of Aseptium technologies (uSonic cleaning systems, VeriTest process challenge devices) and existing NHS systems.
- Identification of contaminants resistant to standard washing procedures.

Potential impacts and outcomes

This project will promote collaboration amongst Inverness Campus stakeholders, highlight regional healthcare innovation activity and support Aseptium marketing and business development activities. It may also help determine the efficacy of decontamination systems used by the NHS, potentially resulting in reduced hospital acquired infections.

City-Region Deal deliverables

Supported company for product innovation: Aseptium Ltd.

External partner:

Aseptium Ltd.

aseptium
Innovative Decontamination Solutions

University lead:

Prof Phil Whitfield,
Head of Lipidomics Research

Establishing a canine cancer registry to improve disease prevention and care

The cancer therapeutics market for animals is expanding by 10% each year with annual global sales exceeding $350 million.

CASE STUDY

Innovation overview

The cancer therapeutics market for animals is undergoing rapid expansion with annual spending now exceeding $350 million. This growth is driven by consumer demand, increased animal lifespans and expansion of pedigree breeding. Cancer registries help identify factors that influence the health and wellbeing of companion and working animals by enabling the identification of common risk factors and clinical diagnostic tests.

This cancer registry, the first of its kind in Scotland, is a collaboration involving the Scottish Rural College, the University of the Highlands and Islands, Scottish Veterinary Referrals and VPG Histology. The project will collect veterinary data and samples including DNA, tissue and bodily fluids, to help identify trends in canine cancer incidence, geographic distribution and survival. Veterinary practices across Scotland will be encouraged to participate and share data of animals under their care.

Objectives

- Establish feasibility for collection and submission of data to a canine cancer registry.
- Coordinate the practicalities of large electronic dataset handling and data security.
- Provide guidance regarding the collection, storage and analysis of veterinary samples and data.

Potential impacts and outcomes

Establishing this cancer registry will provide an important evidence base that could be used to improve care and to drive cancer prevention. Animal cancer registries have also been used to inform and influence human health and wellbeing, by helping to identify common risk factors and shared early warning signs.

City-Region Deal deliverables

Supported company for product innovation:
Scottish Vet Referrals, VPG Histology
New product/service: Canine cancer registry for improving disease prevention and care.

External partner:

Scottish Rural College, Scottish Vet Referrals, VPG Histology

University Lead:

Dr Antonia Pritchard,
Senior lecturer, Genomics and Immunology

User-led design of a digital health technology for improving dementia care

The number of people living with dementia doubles every 20 years, with annual global costs now exceeding $1 trillion.

CASE STUDY

Innovation overview

Evidence suggests that cognitive decline in people with dementia is slower if they can be supported to live in their own homes as independently as possible. At home, most dementia care is provided by families and unpaid carers who often lack adequate support and understanding of condition management. Cognihealth have recently developed CogniCare, a novel digital health technology for improving at home dementia care delivery.

A user-led design process involving patients, carers, clinicians, nurse consultants and dementia advisors will help the development of features that strengthen the CogniCare system. The focus will be on enhancing carers' competence and confidence in identifying symptoms and changes that need to be monitored to reduce unnecessary hospitalisation, enable early intervention, and facilitate improved disease self-management.

Objectives

- Collect and evaluate stakeholder data from patients, carers and healthcare professionals.
- Use collected data to inform the design of new features on the CogniCare digital platform.
- Evaluate and publish results of these studies as appropriate.

Potential impacts and outcomes

This user-led design project will support the design of new features of the CogniCare platform for improving the care of patients with dementia. Results will help evidence the benefits of offering this technology through the NHS.

City-Region Deal deliverables

Supported company for product innovation: Cognihealth Ltd.
New product/service: Measure and track feature of CogniCare.

External partner:

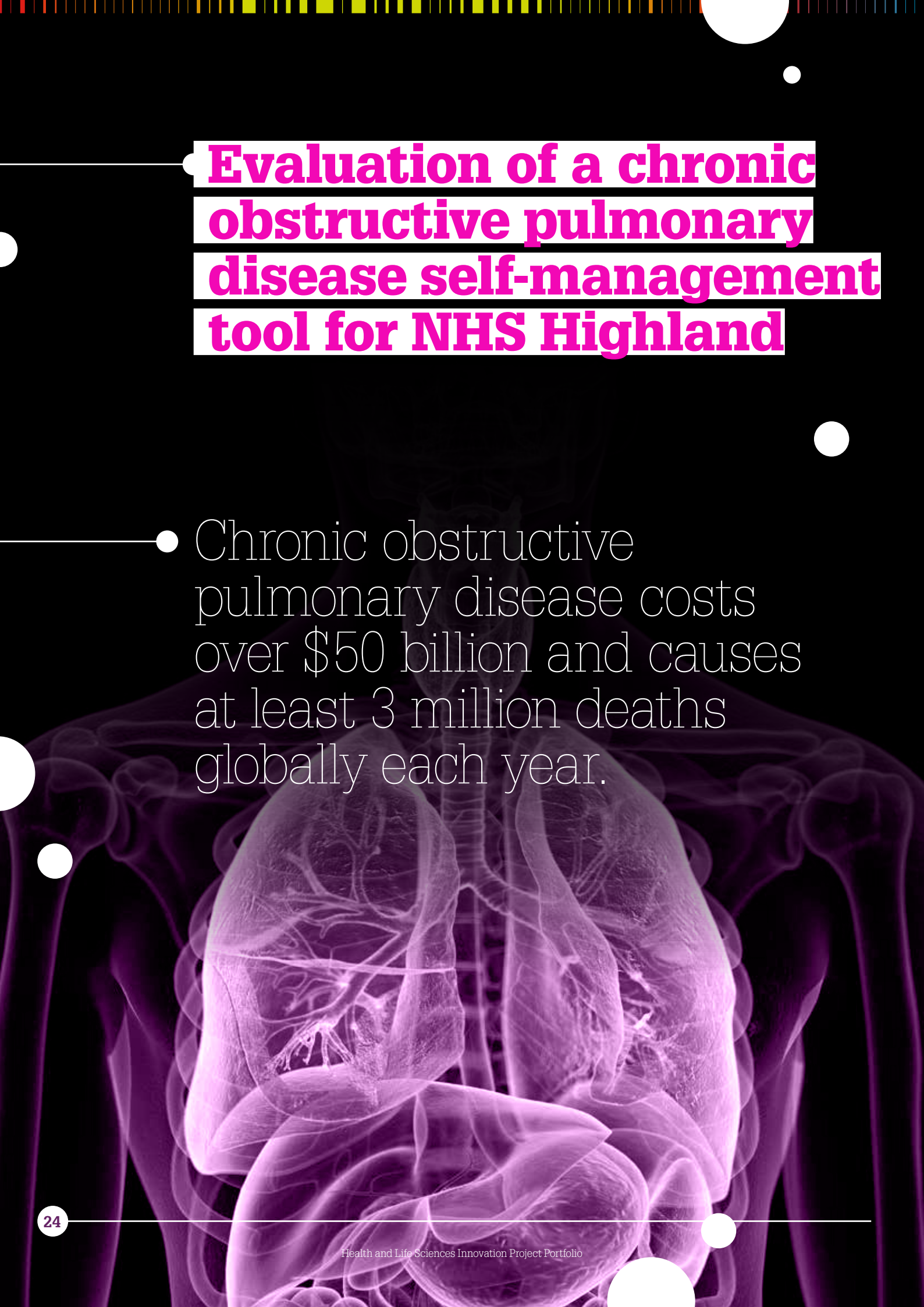
Cognihealth Ltd.

University lead:

Dr Leah Macaden,
Reader, Nursing

Evaluation of a chronic obstructive pulmonary disease self-management tool for NHS Highland

Chronic obstructive pulmonary disease costs over $50 billion and causes at least 3 million deaths globally each year.



CASE STUDY

Innovation overview

Annual NHS costs for chronic obstructive pulmonary disease (COPD) exceed £1.9 billion. Most of this cost is derived from unplanned inpatient admissions following acute disease exacerbation. The mymhelath myCOPD platform is a patient self-management tool that empowers users to manage their disease more effectively by reducing inhaler errors, increasing medication compliance and providing structured education and guidance.

NHS Highland has secured test of change funding to evaluate the myCOPD platform and has approached the University of the Highlands and Islands for assistance in data collection, evaluation, and health economics modelling to support subsequent health board procurement.

Objectives

- Evaluate the clinical and economic impact of myCOPD during the test of change.
- Provide a cost-benefit model and analysis to facilitate downstream procurement decisions.

Potential impacts and outcomes

This project will evaluate the health and economic benefits of the myCOPD digital health platform. Results will be used to evaluate the cost effectiveness of this intervention as well as its impact on overall patient health and wellbeing.

City-Region Deal deliverables

Healthcare service delivery improvement: evaluation of the myCOPD platform for NHS Highland.

External partner:

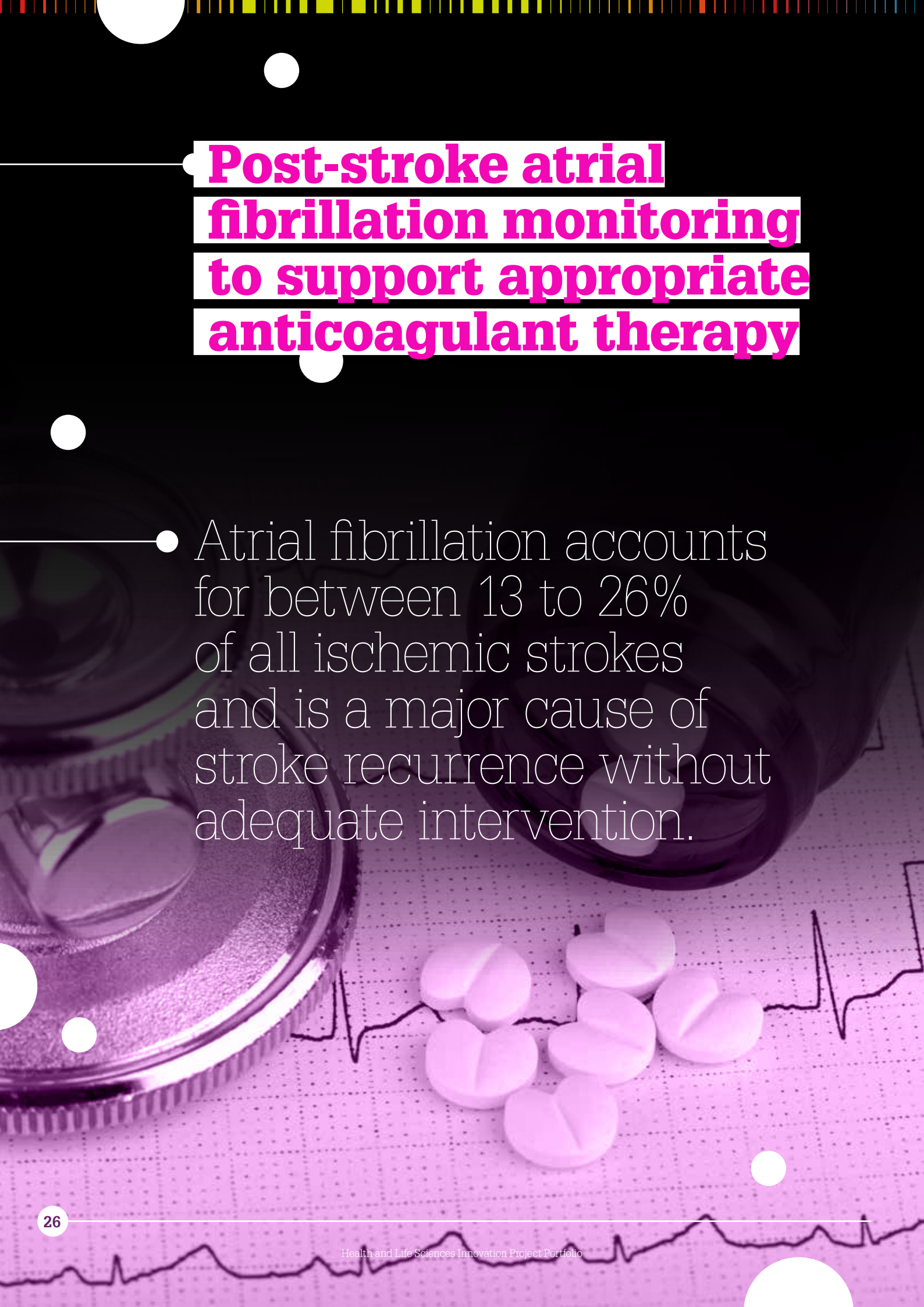
Mymhealth Ltd.

University Lead:

Dr Beth Sage,
Honorary Senior Lecturer and Consultant in Respiratory Medicine (NHS Highland)

Post-stroke atrial fibrillation monitoring to support appropriate anticoagulant therapy

Atrial fibrillation accounts for between 13 to 26% of all ischemic strokes and is a major cause of stroke recurrence without adequate intervention.



CASE STUDY

Innovation overview

Ischemic stroke is the leading cause of adult disability in the developed world and the third leading cause of patient mortality. In patients who have had a stroke, atrial fibrillation greatly increases the chance of a further stroke and is associated with poor prognosis and increased stroke severity. Oral anticoagulants reduce this risk of recurrent stroke in patients with atrial fibrillation and it is therefore critically important to treat these patients appropriately.

The aim of this project is to evaluate atrial fibrillation monitoring technology to improve patient outcomes following stroke. Patients will be offered screening which has not been available before. Based on existing literature, is it expected that 20% of patients will be identified as having atrial fibrillation and therefore offered oral anticoagulation. We anticipate that appropriate oral anticoagulant prescribing may reduce the risk of recurrent stroke by approximately 60%, improving clinical outcomes and reducing healthcare costs.

Objectives

- Establish post-stroke monitoring protocols at the Highland stroke unit.
- Perform monitoring and ensure that patients who are eligible for anticoagulation have this appropriately prescribed.
- Evaluate clinical outcomes and patient satisfaction metrics.

Potential impacts and outcomes

Adoption of atrial fibrillation testing and appropriate oral anticoagulant prescribing has the potential to reduce the risk of recurrent stroke. This will improve patient outcomes, reduce NHS costs and improve compliance with UK national screening guidelines.

City-Region Deal deliverables

Supported company for product innovation:
Daiichi-Sankyo, Ltd.
Healthcare service delivery improvement: Improved monitoring and management of stroke patients.

External partner:

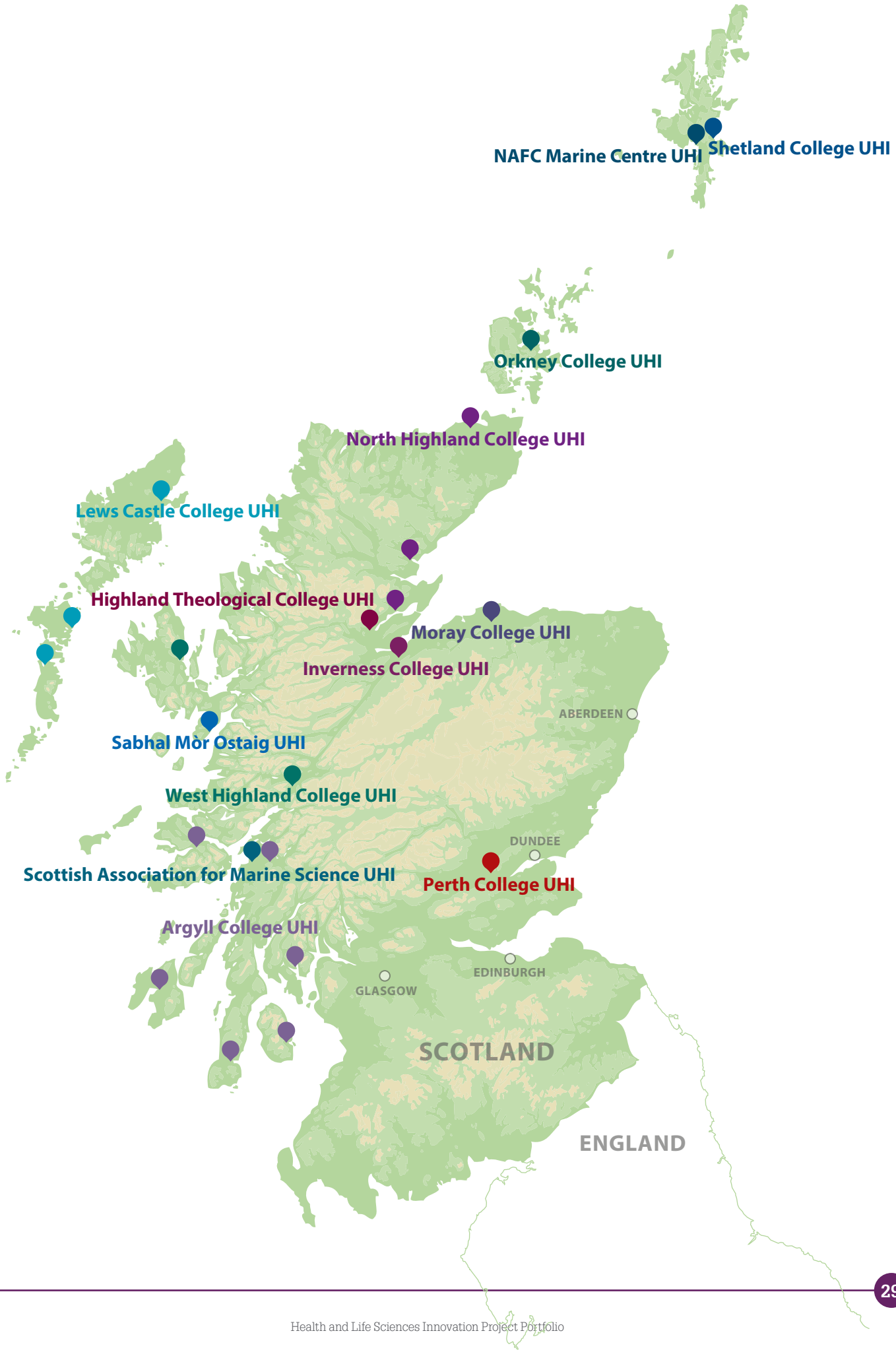
Daiichi-Sankyo, Ltd.

University lead:

Prof Steve Leslie,
Professor of Cardiology and
Consultant cardiologist (NHS Highland)

NOTES

OUR LOCATIONS



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