

**AHSP**

Academic Health  
Science Partnership

Transforming lives through  
**research** and **innovation**



University  
of Dundee



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# 1 Introduction to AHSP

The Academic Health Science Partnership (AHSP) in Tayside brings together the world-leading research at the University of Dundee with the clinical excellence of NHS Tayside. Both the NHS and the University of Dundee have a long history of pioneering research in many fields and continue to lead in biological and clinical areas.

The aim of AHSP is to simplify access to our many areas of research for industry and provide the framework for strategic, holistic partnerships as alliances of strengths. We provide a partnership approach to working with industry to enable access to this breadth and depth of excellent research and innovation.

This is a wholly integrated infrastructure, allowing industry direct and fast access to a wealth of expertise across the innovation spectrum: from bench to bedside.

Our simple and direct pathways are for all stakeholders to engage with the innovation community both within and outside Tayside.

“The ASHP in Tayside is the first of its kind in Scotland and is seen as a success in attracting and engaging commercial partners, creating a path for companies who wish to come to Scotland and work with academic and clinical networks

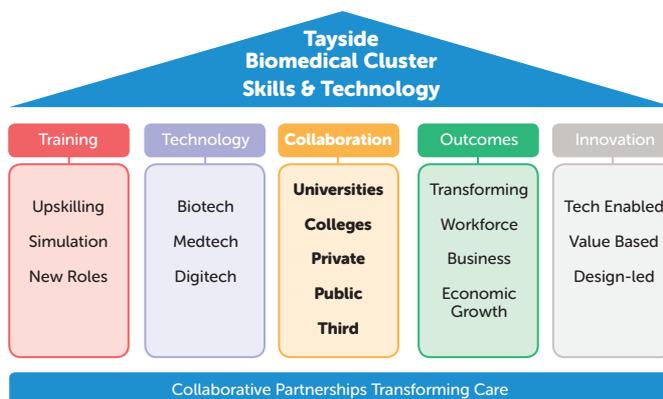
**The Scotsman 2018**



## 1.1. Partners



"Working with you for better health and better care"



University of Dundee

"Transform lives locally and globally through the creation, sharing and application of knowledge"



**AHSP**  
Academic Health Science Partnership

"Creating better health and wealth through collaborative partnerships"

Our aim is to transform patient care through innovative and strategic partnerships using our critical mass of excellence

## 1.2. International ranking of AHSP partners

### Top in the UK for influencing innovation

Nature Index 2017

### No 1 in the UK for Biological Science

Research Excellence Framework 2014

### No 1 in the UK for research that makes a difference in Clinical Medicine

Research Excellence Framework 2014

### Highly Research Intensive

Over 30% of total income at the University of Dundee comes from research (>£70M)

### World's most influential research institution in pharmaceuticals

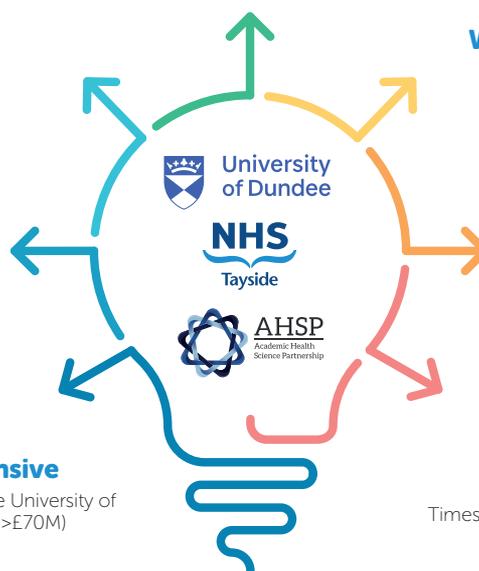
Clarivate Analytics 2017\*

### 8th in the World and 1st in Europe for the proportion of highest-impact (top 1%) research

Biomedical and Health Sciences research impact (CWTS Leiden ranking)

### No 20 in the world for impact on society

Times Higher Education (THE) University Impact Rankings 2019



\*State of Innovation Report - Pharmaceuticals, Clarivate Analytics 2017

### Most influential scientific research institutions in pharmaceuticals (2006-2016)

Institution	Country	# of Papers (WoS)	Category Normalised Citation Impact
University of Dundee	UK	652	2.23
Massachusetts Institute of Technology (MIT)	US	822	2.04
Ecole Polytechnique Federale de Lausanne	France	332	2.04
Howard Hughes Medical Institute	US	429	2.01
Technical University of Denmark	Denmark	636	1.89
University of Edinburgh	UK	836	1.87
NIH National Institute of Mental Health (NIMH)	US	525	1.87
University of California Berkeley	US	825	1.83
Dana-Farber Cancer Institute	US	374	1.83
EC JRC ISPRA Site	Italy	403	1.81

## 2 World class partnerships

*We have an enviable track record of partnering with industry, with the focus being on long-term strategic partnerships. Our partnerships cover basic science to training and education and have resulted in many new discoveries, therapies and devices with commercial success as well as ultimate patient benefit.*

### 2.1. Division of Signal Transduction Therapy (DSTT), University of Dundee

The DSTT is the world's longest running collaboration between academic research and the pharmaceutical industry. The consortium (with up to six major pharma companies including GSK, Boehringer Ingelheim and Merck) has now attracted £58 million of investment since its inception in 1998 and was awarded a Queen's Anniversary Prize for Higher Education in 2006.

*"The model for how industrial-academic collaborations should work"*

GSK

### 2.3. Medtronic

An innovative strategic partnership with Medtronic was set up in 2015 with the University of Dundee and Tayside Health Board under AHSP. The partnership's ultimate aim is to promote high-quality education, training, product development and transformative patient care through project collaboration and joint strategic planning. Medtronic now cites the Dundee Institute for Healthcare Simulation (DIHS) as one of its four centres of excellence in training and education across Europe, the Middle East and Africa.

*"For Medtronic, developing trusted partnerships with world-class institutions is an important element of our work. I have been impressed with what Dundee has to offer and I look forward to working in partnership with them across our areas of mutual interest with a view to improving patient outcomes"*

Jackie Fielding, Vice President, Medtronic UK and Ireland

### 2.2 Karl Storz

As a result of Dundee's significant and seminal role in the development of Minimal Access Surgery pioneered by Professor Sir Alfred Cuschieri, the University has developed a long-standing and successful collaboration with Karl Storz. Over 700 different medical devices for minimal invasive surgery sold by Karl Storz are based on the research work, with nearly 80 sets of instruments containing these devices introduced to the market since 2008. Additionally, Karl Storz has a production facility in Dundee, initiated on the back of the research work carried out.

*"Karl Storz recognises the Dundee Institute for Health Stimulation (DIHS) as our largest established training centre partner. We are proud to be associated with DIHS, incorporating the Cuschieri Skills Centre, which we have supported for 23 years and have every reason to believe that our long-standing, long-term partnership will continue for many years to come"*

Karl Storz Endoscopy (UK) Ltd



## 3 Areas of strength

The University of Dundee and NHS Tayside have a team of recognised world leaders across the research and clinical arenas, coupled with unique expertise and facilities that underpin the innovative and internationally renowned work.

### 3.1. Medical technology

MedTech development has been recognised as internationally excellent at Dundee and expertise can be found in the Institute for Medical Science and Technology (IMSaT), the Surgical Skills Centre, Centre for Anatomy and Human Identification (CAHID) and reaching out more widely across the University of Dundee to disciplines such as engineering, computing and design.



Dundee is known as a UK leader in minimally invasive surgery, image guided therapy and robotics. Significant industrial links enhance this research and allow research and technologies to impact on patient care, society and the economy.

There has been significant growth in our collaborative MedTech activity with industry over the last three years and this is set to grow dramatically following the announcement of a £25m investment from the Scottish Government to grow the Tayside Biomedical Cluster with the focus on stimulating innovation and enterprise. This investment will stimulate inward investment and growth of new biotech and MedTech companies.

**Institute for Medical Science and Technology (IMSaT)** conducts world-class research and development in several areas, promising valuable advances for patients, healthcare providers and life science companies alike.

- **Diagnostic & therapeutic imaging:** the application of advanced cellular and molecular imaging techniques will revolutionise drug discovery & evaluation, diagnostics, and therapies (e.g. using MRI and ultrasound and advancing instrumentation including robotics to provide precise placement of probes and destructive energy to destroy or shrink malignant tumours)
- **Drug delivery:** new technologies for delivering drugs in a highly targeted, efficient fashion will establish new standards of clinical efficacy, efficiency and patient care
- **Regenerative medicine:** technologies for wound healing and tissue correction have huge economic potential for the medical device and allied biotechnology industries
- **Minimally invasive surgical techniques:** emerging technologies such as Minimal Access Surgery, ultrasound imaging, radio-frequency devices, cryogenics and lasers are driving the potential for new state-of-the-art equipment

### 3.2 Cardiovascular

We have an established strength in medical devices development particularly around cardiovascular devices. Through collaborative partnerships with industry, we have worked closely in the R&D and regulatory testing of Medtech devices using our novel Thiel cadaveric and cardiovascular fluid dynamics modelling.

In addition, we have a world class Clinical Imaging Research Facility comprising state of the art clinical imaging (MRI, Interventional capable CT, and digital PET/CT offering high quality diagnostic imaging and interventional capabilities.

### 3.3 Electronic medical records for biomedical research

Through long-term partnership with the NHS, the University of Dundee has developed a world-class reputation for high quality clinically relevant epidemiological and pharmacoepidemiological research based on a world leading medical informatics infrastructure. All individuals in Scotland are provided with a unique identifier when registering with their primary care provider. In the Tayside region of Scotland for the past 30 years, this unique identifier has been used for all healthcare activity. This has enabled the development of an advanced regional

clinical informatics research infrastructure that enables long-term 'cradle to grave' electronic medical records to undertake studies for all 400,000 individuals in the region. This infrastructure has underpinned the development of a range of major strengths at the University including diabetes research, the generation of large population-based bioresources for genomic studies and the advanced expertise in the management of large-scale anonymised clinical data for research through the Health Informatics Centre.

### 3.4 Diabetes

Dundee is one of the premier centres for diabetes research in Europe, spanning epidemiology and genetic epidemiology, clinical trials and human physiology, and translational laboratory science. Dundee has contributed to major breakthroughs in the study of insulin action and metabolic control including the identification of PDK1, AMP activated protein kinase (AMPK), and GSK3. At the population level, Dundee has developed the electronic health record system that is now used across Scotland (SCI-Diabetes) and has pioneered the use of this electronic health record data and the potential for linkage to bioresources for novel discovery, diagnostics, translational science and improved patient care.

Tayside has continuously and consistently collaborated with major pharma in both basic research and clinical trials and is involved in significant private-public partnerships such as:

- IMI-DIRECT (Sanofi, Boehringer Ingelheim, Servier, Novo Nordisk and Eli Lilly)
- IMI-RHAPSODY (Servier, Lilly, Novo Nordisk, J&J, Sanofi)
- IMI-Hypo-RESOLVE (Abbott, Lilly, Medtronic, Novo Nordisk, Sanofi)
- IMI-Beat-DKD (Abbvie, Astellas, Bayer, BI, Lilly, Novo Nordisk, Sanofi)



### 3.5 Large bioresources linked to comprehensive electronic medical records for precision medicine research

Dundee has been recognised as one of the top institutes for pharmacogenomic research in Europe. As well as world-leading researchers, unique resources are available through the bioresource facility that researchers can access and data mine.

#### The strength of bioresources linked to real world data

The Tayside Bioresource is a portfolio of individual studies that have been recruiting participants from Tayside to genetic research since 1997. Patients have consented for linkage of their biological samples (DNA, serum, sputum, urine) to their longitudinal electronic health record data. This includes:

- >18,000 participants in the GoDARTS Type 2 diabetes case control bioresource.
- >7000 adult patients with type 1 diabetes in the SDRN Type 1 diabetes
- >200,000 participants registered for the GoSHARE initiative, a national bioresource
- 13,000 individuals have undergone genome wide genotyping greatly facilitating genomic and pharmacogenetics research and, through various

currently funded initiatives, the number with available genome-wide genotyping across the Tayside Bioresource will expand to over 70,000 individuals

- TARDIS database, a unique resource containing detailed information on over 6000 patients with COPD

The genomic resource, linked to the comprehensive and highly detailed longitudinal electronic medical records, generates new and pivotal insight into the pathogenesis of diseases (new drug targets).

The GoDARTS resource of 10,000 patients with diabetes for example has been a key cohort in many of the genetic discoveries in diabetes in the last 10 years, published in Science, Nature and Nature Genetic.

Researchers have also investigated the genetics of retinopathy, nephropathy, neuropathy, chronic liver disease, peripheral vascular disease, stroke and cardiovascular disease.

#### Research highlights:

- Genome wide hits for metformin response (Zhou et al. Nature Genetics 2011 and Nature Genetics 2016)
- Establishing that metformin response is heritable (Zhou et al. Lancet Diabetes & Endocrinology 2013)
- Genetic and drug–interaction mechanism explaining a four-fold increase risk for intolerance to metformin (Dujic et al Diabetes 2015)
- Multiple publications on the genetic basis for susceptibility to common diseases such as type 2 diabetes, heart disease, asthma and cancer

#### Realising Precision Medicine in the NHS

By harnessing the combination of advanced local clinical informatics infrastructure and the expanding Tayside Bioresources, NHS Tayside has become a pioneering leader in

the routine clinical delivery of Precision Medicine in the NHS through P4Me initiative.

P4Me is a collaboration between University of Dundee, NHS Tayside and STORM ID and funded by The Data Lab. The primary goal of P4Me is to use pre-existing information in the genome to identify patients for whom a widely prescribed antiplatelet drug used to prevent strokes and heart attacks, is ineffective and give them alternative therapy.

The knowledge and experience developed through P4Me will enable Precision Medicine to become mainstream in the NHS in a greater number of clinical situations.

*Flynn RW, MacDonald TM, Murray GD, MacWalter RS, Doney AS. Prescribing antiplatelet medicine and subsequent events after intracerebral hemorrhage. Stroke. 2010 Nov;41(11):2606-11*

### 3.6 Health informatics

The Health Informatics Centre (HIC) at Dundee (is a University research support unit that works closely with the NHS. Established over 10 years ago, the HIC is a recognised leader in health data linkage and maintains a clinical data repository of eHealth data covering approximately 20% of the Scottish population. Over the past 5 years, HIC has supported over 600 research projects totalling over £156M in grant funding. The service provides expertise in data linkage, software development, data governance, secure infrastructures, recruitment to clinical trials, BIG data (including genomic and clinical images) and

machine learning/AI. HIC runs a Scottish Government accredited and ISO27001 certified Safe Haven environment for secure access to anonymised data. All these services are available for industry (with appropriate data governance approvals).

The University of Dundee is part of the Scottish node of the Health Data Research UK (HDR-UK) Institute. The School of Medicine and Engineering and the Health Informatics Centre are major contributors to the precision therapeutics theme, developing a national infrastructure for federated data and UK-wide imaging data.

### 3.7 Dundee Centre for Antimicrobial Resistance

Antimicrobial resistance has been identified as a current major public health threat. The Centre for Antimicrobial Resistance at the University of Dundee brings together biologists, chemists, physicists, clinicians, mathematicians, epidemiologists, engineers and designers to focus on innovation in tackling antimicrobial resistance. Members of the Centre are located across the institution in the School of Life Sciences Research, the School of Medicine, the School of Science and Engineering, the School of Computing, Duncan of Jordanstone College of Art & Design and NHS Tayside.

Researchers within the Centre work on a variety of areas such as identifying targets for new therapeutic agents through basic research, developing innovative technologies for application in AMR research, driving leadership in antibiotic stewardship, including through impactful clinical research, and performing drug discovery programmes to develop new antimicrobial agents.

Collectively, the Centre has significant collaborations with industry, as well as funding from major research funders.

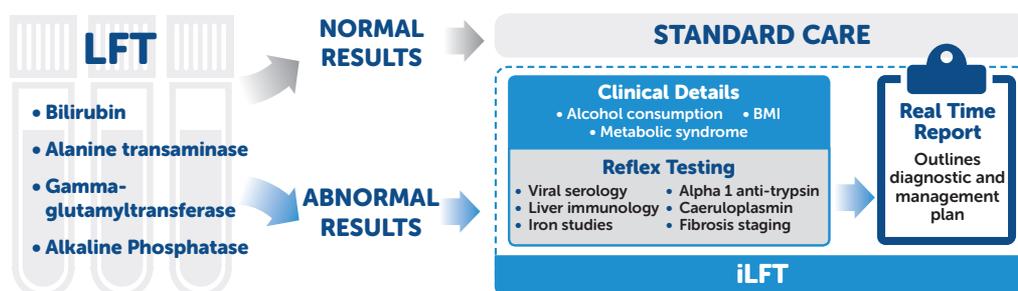
### 3.8 Diagnostics

*Intelligent Liver Function Testing (iLFT) – an emerging partnership with Abbott*

A strategic and novel Intelligent Liver Function Algorithm (iLFT) was developed by a team at the University of Dundee/NHS Tayside using minimum diagnostic criteria as well as automated track analysers and liver fibrosis markers with high negative predictive values.

The care team hypothesised that integration of the automated iLFT algorithm would enable early identification of treatable disease and make the healthcare process much more efficient and cost-effective. Abbott are now working with the team to disseminate the success story and discussions are underway around wider implementation.

*“ This is an excellent example of the AHSP partnership in action - high quality clinical research with digital innovation that has real patient benefit and can reach global markets through industrial partnering.*



#### AWARDS FOR iLFT

##### Innovation Award

The Royal College of Physicians Excellence in Patient Care Awards 2019

##### UNIVANTS of Healthcare Excellence Award 2019

##### Best patient benefit in gastroenterology and hepatology

Frontline Gastroenterology 2019

##### Innovation Award

Royal College of Pathology Excellence Awards 2019

##### Digital Innovation (Highly Commended)

BMJ Awards 2019

##### Innovation in Practice Star Award

NHS Tayside 2019

### 3.9 Medical technology evaluation

Dundee has excellent test bed facilities for various types of devices and other medical technologies including the Dundee Institute for Healthcare Simulation Surgical Skills Centre and the Centre for Anatomy and Human Identification (CAHID).

The DIHS provides a unique innovation environment for industry/clinician/academic engagement. Industry is an essential partner in supporting the provision of high quality training using the latest technologies in a simulated clinical environment. Enterprises, such as medical device companies, are able to interact directly with key clinicians and academics from the UK and overseas to showcase their products to potential end users.

A unique benefit in Dundee for training surgeons and clinical teams is access to Thiel embalmed human cadavers. The Thiel soft fix embalming technique is a sophisticated method of preservation of complete human cadavers that allows them to maintain many features of a live body, particularly with regard to the authenticity of colour, tissue consistency and flexibility. Benefits include reduced risk of infection, minimal odour, negligible formalin levels, reduced deterioration compared to fresh frozen cadavers and longevity – bodies can be kept for 3 years. These cadavers can also provide good quality medical images (ultrasound, X-ray, CT and MRI) and can be used to simulate many clinical or operative procedures, such as bronchoscopy, arthroscopy, laparoscopy, endoscopy, etc.

CAHID was the first UK institution to take up the Thiel soft fix embalming method and, with several years of experience, is now considered the UK's leading Thiel facility. CAHID accepts around 90 donations each year and at any one time has

approximately 200 Thiel cadavers in its care. The Centre offers two dissection facilities with either 9 or 30 tables and a range of lecture theatres and seminar rooms.

#### Collaboration opportunities include:

- Development and testing of medical devices - also with the Image Guided Therapy Research Facility (IGTRF)
- Training of clinical and surgical staff
- Research and educational opportunities

**“** *The cadaveric models provide an ideal model for industry to test new devices to support regulatory applications.*



## 4 Quality Improvement

*Innovation has an important role to play in our approach to improving patient experience and clinical pathways.*

The Chief Medical Officer report, Realistic Medicine, and the Scottish Government Annual Report 2017-2018 are major drivers for this, encouraging shared decision making, reduced waste and unwarranted variation in practice and support provision of value-based healthcare.

As an example, we have partnered with The Patient Journey app to develop a method to support 'prehabilitation'. This is where patients are properly informed before consulting their surgeon and there is the ability to have two-way communications to try and impact on smoking cessation and weight reduction to optimise their preoperative condition.

## 5 TASC *Tayside Medical Science Centre*

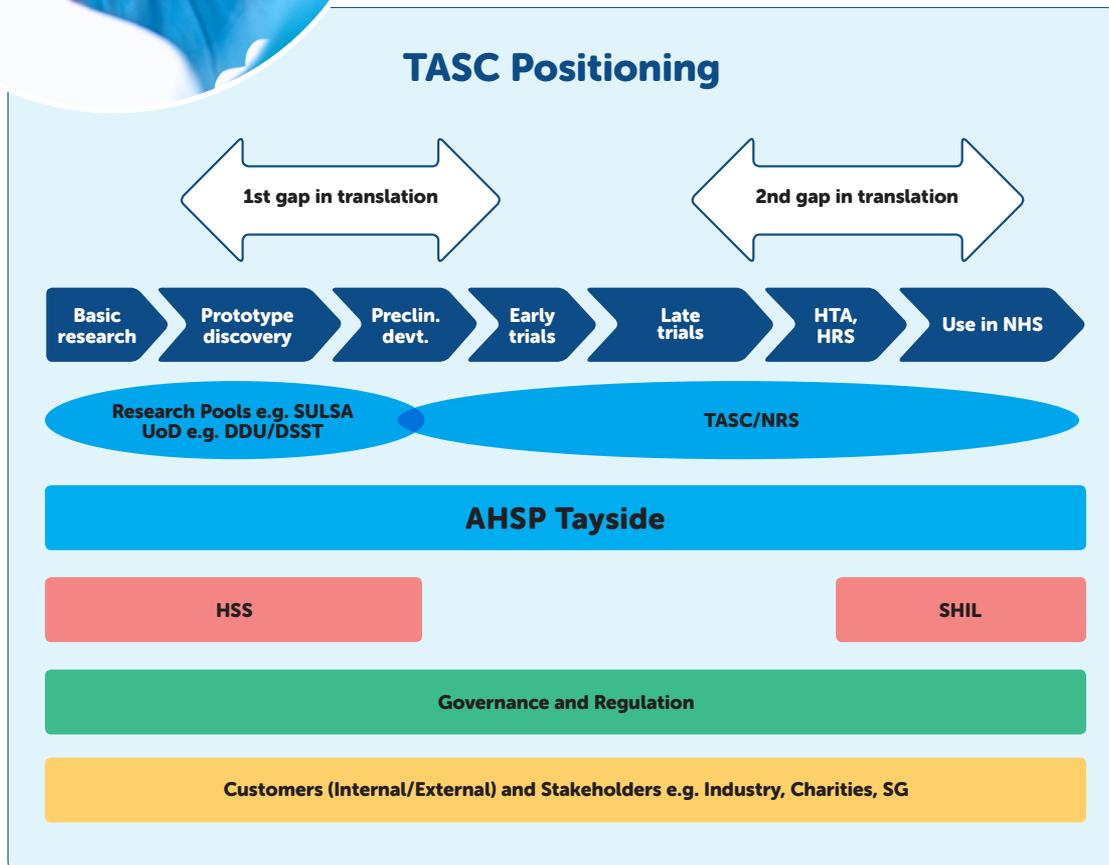
Tayside Medical Science Centre (TASC) was formally established in 2010 to combine the research strengths of the University of Dundee with those of NHS Tayside within a single organisational framework. Its mission is in 'supporting the safe research of today, delivering better treatments for tomorrow and improving the health of future generations'.

TASC underpins the activities of the AHSP in Tayside and brings together, within a single organisational framework, the existing functions of the Clinical Research Centre, Clinical Research

Imaging Facility (CRIF), the Tayside Clinical Trials Unit (TCTU), the Tayside Biorepository and the joint functions of the NHS Research & Development office and the University's Research & Innovation Services (in relation to clinical research). This strategic alignment brings greater efficiency to research management and governance across the University and NHS. It also provides an integrated infrastructure and streamlined service for all healthcare professionals for supporting research and engagement with commercial partners where appropriate.

“ Within the UK there's plenty of places where you can find smart people and there's also plenty of places easy to do business with. There aren't very many places where you get the two of them together and this is one of them.

**Industry**



Source: Cooksey Review - 2006



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