All-Party Parliamentary Group on Medical Research

The Journey of Medical Research:
From Bench to Bedside
Transforming Patients’ Lives and Boosting the UK Economy

“The most important intervention we can make is to back British jobs, British science, British research and development, British medicines and British technology...”

David Cameron,
Prime Minister (May 2014)
Introduction

Medical research is the UK’s favourite charitable cause. It helps people live longer, healthier, happier lives by delivering new diagnostic tests and treatments, many of which will make personalised care a reality for patients. Through research we are learning how changes to our lifestyles can prevent some diseases altogether. Medical research also delivers substantial economic benefits: every pound spent by the government on research increases private sector R&D investment by 20p every year.

In this booklet we present a selection of the best medical research taking place in the UK. Through these case studies we explain the journey of medical research: from basic experiments at the laboratory bench, through to the clinical trials which evaluate innovative diagnostic tools, medicines and medical devices, culminating in treatments and interventions at the patient’s bedside or in the clinic.

The UK life sciences sector is a true jewel in the crown. Research leads to the development of market-leading medical interventions that are key UK exports; it helps raise awareness of important health issues and it informs health policy. UK science is heavily supported by investment from government, charities and the life sciences industry. This cross-sector collaboration is showcased in many of the research projects presented in this booklet.

Public investment in medical research is central to leveraging charity and private funds in the UK life sciences sector. Stable, long-term support from government is needed to provide confidence to all funders, including global investors, in order to protect our world-class science, both for the benefit of patients and for the growth of our economy.

The Report was compiled and funded by the secretariat for the APPG on Medical Research

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About the All-Party Parliamentary Group on Medical Research

The All-Party Parliamentary Group on Medical Research includes MPs and peers from across the political parties. Established in December 2005, it provides an ongoing forum and network for Parliamentarians with an interest in the medical research sector. It aims to facilitate collaboration between parliamentarians and medical research bodies and to provide up to date information on developments in medical research, including aspects of public health, the ethics of research and the implications of research findings for society.

The APPG is supported by the Academy of Medical Sciences, Arthritis Research UK, Association of Medical Research Charities, British Heart Foundation, Cancer Research UK, Medical Research Council and Wellcome Trust which together coordinate the group’s secretariat.

Key Messages

- Medical research delivers treatments and cures for patients. As well as improving people’s lives, this investment creates UK jobs and delivers significant economic returns.

- Government spending on science provides the foundations on which industry and charities can invest, leveraging further funding for UK science.

- Continued government investment in research is needed so that UK patients can continue to benefit from new treatments.
Stage One: Discovery

Ground-breaking medical advances often originate from basic experimental research in the laboratory and population based research using large datasets. Research is vital to advance knowledge of the fundamental way the human body works and can open up new avenues for exploration across the whole spectrum of health. These early insights may take years to be translated into new treatments, but the impact they have can change the face of healthcare forever.

For example, laboratory research in the 1970s led to the discovery of monoclonal antibodies. These now form the basis for a third of all new drugs in development for a wide range of diseases including cancer, arthritis and multiple sclerosis. These drugs are expected to reach a global market of $60bn by the end of this century.

Case Study 1.1: Wellcome Trust Centre for Mitochondrial Research (Newcastle)

This Newcastle-based centre-of-excellence is built on clinical and scientific expertise in mitochondria — the ‘battery packs’ of cells. Around one in 200 babies in the UK is born with defects in their mitochondrial DNA and about one in 6500 go on to develop conditions that lead to serious disability and often death. The centre’s research is focused on understanding and combating this, including the development of its pioneering mitochondrial donation technique. This allows faulty mitochondria, which are passed from a mother to her children, to be replaced with healthy ones from a donor.

In February 2015, Parliament approved regulations to permit mitochondrial donation. This will enable the Human Fertilisation and Embryology Authority to consider each family’s treatment on a case by case basis, taking expert scientific and medical advice, and allowing the licensing process to begin if the risks are considered to be low. The UK is the first country to approve this technique, leading the world in this area and giving hope to the thousands of families affected by these devastating diseases.

Medical research is the UK’s favourite charitable cause, with around 7.6 million people donating each month.
Case Study 1.2: Arthritis Research UK - Medical Research Council Centre for Musculoskeletal Health and Work (Southampton)

The National Centre of Excellence for Musculoskeletal Health and Work is a multidisciplinary collaboration funded by Arthritis Research UK and the Medical Research Council. The Centre is coordinated by the University of Southampton with collaboration from 14 other UK academic institutions.

The overarching aim of the Centre’s work is to identify cost-effective ways to minimise the substantial adverse impacts of musculoskeletal disorders in the workplace. The centre is committed to:

- preventing musculoskeletal ill-health caused by work;
- improving advice on fitness to work and return to work for those who have undergone musculoskeletal surgery;
- identifying interventions to support the extended working lives of older workers, especially those with musculoskeletal disorders;
- training a new generation of researchers with a broad range of skills.

Supported by Arthritis Research UK, the Medical Research Council and the University of Southampton.

Case Study 1.3: The Francis Crick Institute (London)

The Francis Crick Institute opens in 2015 and will be one of Europe’s largest centres of biomedical research. It is the result of long-term investment and collaboration between the UK Government, universities and charities, and will conduct cutting-edge research to help understand why disease develops and to find new ways to treat, diagnose and prevent illnesses such as cancer, heart disease, stroke, infections, and neurodegenerative diseases.

It is committed to the highest quality science, delivered through a focus on the best and most imaginative scientists and a broad and flexible approach to its scientific programme.

By bringing together scientists from many disciplines, the Crick will help to improve people’s lives and keep the UK at the forefront of innovation in medical research, attracting high-value investment and strengthening the economy.

Supported by the Medical Research Council, Cancer Research UK, the Wellcome Trust, University College London, Imperial College London and King’s College London.
Working together to support medical research

- **Universities**
- **RCUK**
- **Innovate UK**
- **EU Funding**

**Innovation UK**
- **£7.2 billion**
- **Exploring Science**
- **Developing Cures**
- **Building Capacity**

- **Industry**
  - £4.1bn
- **MRC**
  - £845m
- **NIHR**
  - £1bn*
- **Charities**
  - £1.3bn

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Helping Patients
- Advancing Knowledge
- Boosting Economy

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One in 30 people in the UK take part in health research

One eighth of the world's most popular prescription medicines were developed in the UK

In 2014 7.6 million people gave to medical research charities each month, more than any other charitable cause

£££

Over 800 products and treatments were in development from MRC research between 2006 and 2013

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* England funding only, from NIHR Annual Report 2013/14. Figure likely to be higher when including devolved nations funding.

** Total annual funding including devolved nations' funding, Innovate UK, EU funding, etc. likely to be in excess of £8bn.
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Stage Two: Clinical Trials

Clinical trials test how safe and effective treatments are in humans. New medicines or medical devices are tested against existing treatments or placebos to determine which works the best and to test for side effects.

Clinical trials are divided into different stages, called phases. The earliest phase trials may look at whether a drug is safe or whether it produces any serious side-affects. A later phase trial will aim to test whether a new treatment is better than existing treatments. Some trials may involve a small number of healthy volunteers whilst others may involve thousands of patients, over a much longer period of time.

Case Study 2.1: Improving Heart Attack Diagnosis in Women (Edinburgh)

In a study of over 1,000 men and women admitted to hospital with chest pain, researchers from the University of Edinburgh evaluated the effectiveness of a blood test which diagnoses heart attacks. The researchers found that a new higher sensitivity test doubled the diagnoses of heart attacks in women, bringing the proportion of women who were diagnosed with a heart attack in line with men.

With further funding from the British Heart Foundation, the researchers will now carry out an even bigger clinical trial of over 26,000 patients. If the initial results are confirmed, using a high sensitivity test with a threshold specific to each gender could save many more women’s lives.

Supported by British Heart Foundation and the University of Edinburgh.
Case Study 2.2: Join Dementia Research (UK-wide)

*Join Dementia Research* is a new national online and telephone service that matches people interested in dementia research with appropriate studies and the researchers carrying out those studies. By reducing costs and the length of time it takes to carry out research, the service will ultimately lead to improved patient experience and service quality, better outcomes for people with dementia, and increased inward investment for the UK.

*Supported by National Institute for Health Research, Alzheimer’s Research UK, Alzheimer’s Society and Alzheimer Scotland, and endorsed by the Health Research Authority.*

Case Study 2.3: One Step Closer to the Artificial Pancreas (Cambridge, Leeds, London, and International)

The ‘artificial pancreas’ device has the potential to revolutionise the treatment of type 1 diabetes. People with type 1 diabetes need to take insulin to stay alive – and will often inject more than six times a day. They also have to test their blood sugars regularly and use that information to calculate their insulin dose. These calculations are complex and a source of constant worry. Most people struggle to stay within their blood sugar target range and experience periods of low and high blood glucose levels. The ‘artificial pancreas’ automatically calculates and delivers the right dose at the right time and is a huge step forward in lifting the burden of type 1 diabetes.

*Supported by the Juvenile Diabetes Research Foundation, Diabetes UK, University of Cambridge, National Institutes of Health, National Institute for Health Research, and the European Commission.*
Stage Three: Delivering Impact

The UK has a world leading medical research sector, renowned for its excellence. From the groundbreaking discovery of penicillin by Sir Alexander Fleming in 1928 to the unveiling of the structure of DNA, the UK’s life sciences sector has continued to punch well above its weight on the world stage. It continues to advance solutions to some of the most complex global health problems, strengthening the knowledge base and producing some of the best scientists in the world, as well as delivering significant economic returns on investment.

Advances in medical research have ensured that people now live longer, healthier lives. New diagnostic tests ensure earlier diagnosis and treatment; people recover from, and live with, diseases that would once have caused early death. And advances in the way we understand illness mean that lifestyle changes may prevent some diseases altogether.

Case Study 3.1: Preventing Brain Injury in Newborn Babies (London)

Every year in the UK more than 1000 babies experience oxygen starvation at birth. Until recently, around a third of these babies died and another third were left with permanent disability due to brain injury. The impact on families can be enormous and the lifetime cost of looking after a significantly disabled child can be up to £7 million.

The TOBY trial\(^1\) showed that cooling babies to 33.5°C for 72 hours can prevent brain damage.

Cooling therapy for newborn babies was incorporated into NICE guidelines in 2010 and has created savings of £125 million to the NHS and wider economy over the last three years.

Supported by Sparks and the Medical Research Council.

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\(^1\) Whole Body Hypothermia for the Treatment of Perinatal Asphyxial Encephalopathy
Case Study 3.2: Bowel Scope Screening (UK-wide)

Bowel cancer is the fourth most common cancer in the UK. Bowel Scope screening offers the opportunity to catch this cancer early in order to prevent it and save more lives.

Bowel Scope screening uses a flexible tube with a camera and a light on the end to look into your lower bowel. It can spot both early-stage cancers and pre-cancerous growths known as ‘polyps,’ which can be immediately removed to prevent them developing into cancer.

Bowel Scope screening has the potential to prevent thousands of people in the UK from developing and dying from bowel cancer and could save the NHS around £300 million each year.

Supported by Cancer Research UK, Medical Research Council, National Institute for Health Research and KeyMed.

Case Study 3.3: Talking Treatments by Telephone (Midlands and East)

In a study of nearly 40,000 patients using Improving Access to Psychological Therapies services across the East of England, researchers at the University of Cambridge, together with the NIHR Collaboration for Leadership in Applied Health Research and Care East of England and NHS Midlands and East, compared the effectiveness of receiving Cognitive Behavioural Therapy face-to-face and over the telephone. The researchers found that, for all but a minority of patients with more severe depression, treatment given over the telephone was as effective as face-to-face.

Providing therapy by telephone is cheaper, more convenient for patients, and more accessible to those with physical disabilities, transport difficulties and/or heavy work commitments.

Supported by the National Institute for Health Research, NHS Midlands and East and the University of Cambridge.
# Calendar of Events

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<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>July 2015</td>
<td>The Journey of Medical Research: From Bench to Bedside (summer drop-in)</td>
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<tr>
<td>Autumn 2015</td>
<td>Transforming the NHS into a research powerhouse (breakfast meeting)</td>
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<tr>
<td>January 2016</td>
<td>Accelerating patient access to innovative treatments (annual dinner)</td>
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If you would like to join the APPG and help shape future events, or to find out more about the group’s work, please contact Katherine Mayes at appg@amrc.org.uk. #APPGMedResearch