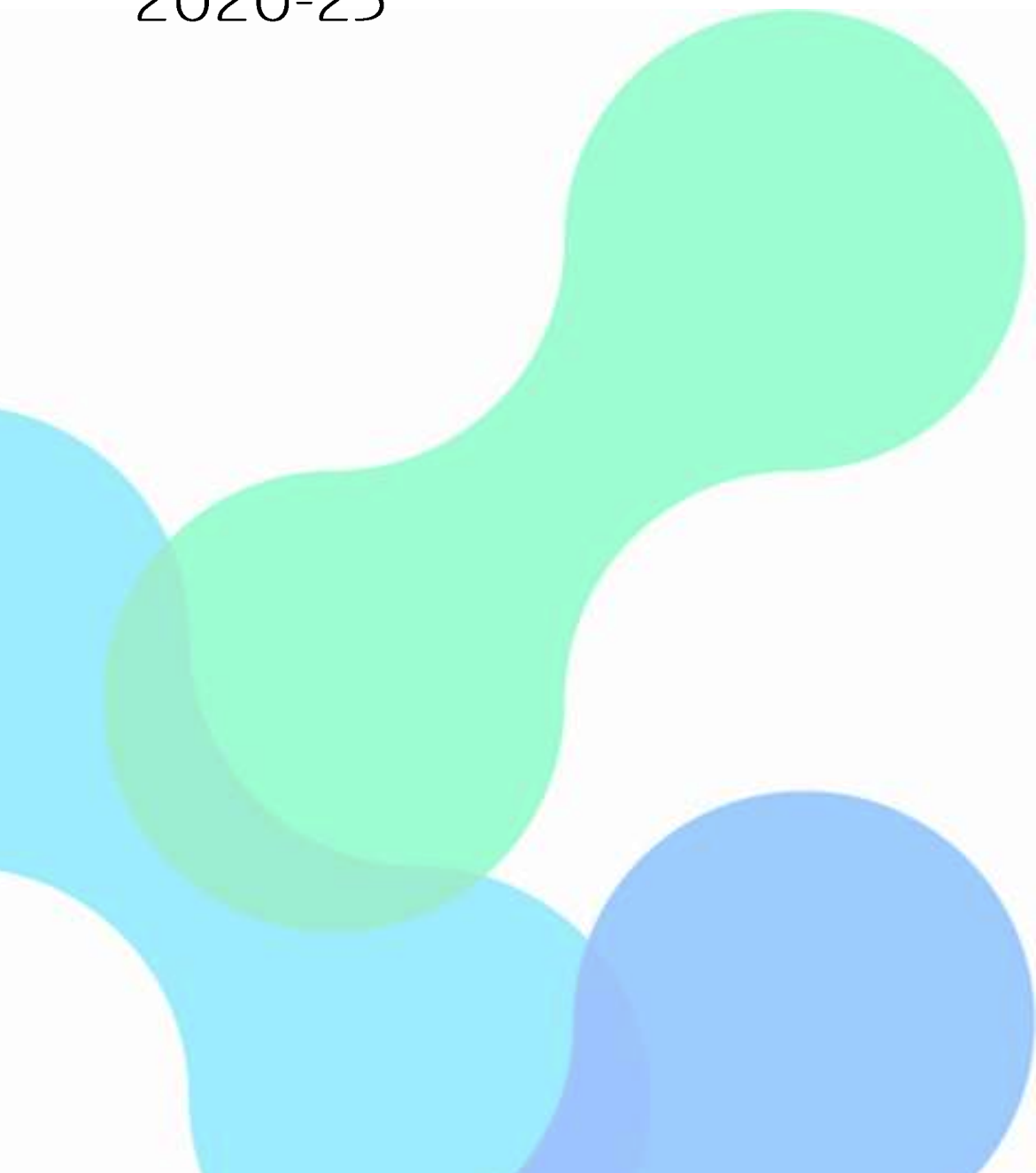
Orthopaedic Research UK

Our Research Strategy

2020-23



"We aim to reduce the burden of poor musculoskeletal (MSK) health on individuals, workplaces and our health system by providing training and education programmes for MSK professionals and by funding research projects and breakthrough innovations (in partnership with grant givers, leading academic institutions and entrepreneurs) that expand knowledge, improve patient outcomes and pioneer new forms of orthopaedic diagnosis and treatment."

Executive summary

Our primary purpose is to use our funding to encourage breakthrough research and education programmes in bone, joint and muscle wellbeing and thereby reduce the burden of poor musculoskeletal health on individuals, workplaces and our health system.

We fund innovative research projects in the UK that expand knowledge, improve patient outcomes and pioneer new forms of orthopaedic diagnosis and treatment. Our investment makes a real difference to the lives of millions of people suffering poor orthopaedic health, today and into the future.

Clinical and scientific research is key to the advancement of knowledge and expertise within medical schools in universities and hospitals. Through our funding, these institutions are able to provide academic research positions or research fellowships that may not otherwise be possible. This opens up new research areas and directly benefits early-career to experienced researchers. Surgeons also benefit from access to cutting-edge research and improved training, helping them to provide better treatment and outcomes to patients.

The value of our research programme during 2021/22 will be £1m, which represents a doubling of investment since 2020/21. This figure includes £800K for the ORUK Research Fund 2021 and £210K for research in partnership with others including the Royal College of Surgeons of England, the Royal College of Surgeons of Edinburgh and the British Hip Society.

Since 2004 we have invested £11m on research on 140 projects in the UK.
Over the next three years we plan to invest a further £2.5 on research and attract £0.5m in partner contributions. In this document we outline how we intend to invest this research funding over the next three years to achieve our strategic vision.

Our research objectives

We fund MSK research in the areas of diagnosis and treatment to:

- Expand knowledge.
- Improve patient outcomes.
- Pioneer new forms of treatment.
- Improve support for patients.
- Ease the burden on the NHS.
- Develop our understanding of MSK conditions.

Our measures for success are:

- Increased awareness of our research among professionals and patients.
- The nurturing of talent within the field of MSK medicine.
- The recruitment of advocates for our research within the broader MSK community.
- Securing co-funding from partners for our research projects.
- Peer-reviewed publications of the results of our funded research

The results of research are generally readily available in the public domain through the publication of results in the media and the public presentation of research projects. These presentations and publications are always peer reviewed to ensure a consistently high quality of research.

The principles underpinning our research investments

We have agreed the following principles for our research investments over the next three years:

1. Focus on diagnosis and treatment.
2. Deliver tangible and more immediate impact.
3. Broaden our reach to include research undertaken by non-traditional stakeholders in need of our funding, rather than concentrating purely on funding orthopaedic surgeons or academics.
4. Expand the impact of our annual investments by encouraging co-funding from partners, including leading academic institutions.
5. Co-opt experts with relevant skills and patients with a lived experience of poor musculoskeletal health to our Research and Scientific Advisory Committees.
6. Adhering to AMRC's principles of peer review and process.
7. Operate openly and transparently in relation to the use of animals in research by committing to the 3Rs of *reduction*, *replacement* and refinement. Research funded outside the UK must be carried out in the spirit of UK legislation governing animal welfare as well as being compliant with all local legislation and ethical review processes. Alongside other medical research charities, we work together through AMRC to continually review our funding practices and engage with the wider scientific community to encourage better practice and the development of animal alternatives.

The need for research funding

Poor musculoskeletal health affects nearly 19 million people across the UK, causing pain, disability, fatigue and often anxiety, depression or social isolation. This already represents a significant burden on people, society and the NHS and demand will only increase as our population continues to age. The disruption to our hospitals caused by the pandemic has worsened the situation, with waiting lists for orthopaedic surgery at record levels: according to British Orthopaedic Association, elective trauma and orthopaedic surgery is the worst affected specialty, with 35,000 people who have waited more than a year and 244,536 who have waited more than 18 weeks for treatment [1].

This challenge cannot be solved simply by increasing capacity, but requires new approaches and new ideas for diagnosis and treatment, underpinned by authoritative research studies.

1 Trauma and Orthopaedic data for England, published 10th December 2020.

Our research grants

The ORUK Early-career Research Fellowships

This fund will provide a total of up to £440k to cover four fellowships over two years. It is designed to support the brightest and best academic talents interested in advancing MSK research in the UK. The aim is to establish researchers' academic independence and international reputation, support them to become future MSK leaders and encourage them to become ambassadors for ORUK.

It is open to early-career clinical and scientific academics who have successfully completed their PhD or MD.

The ORUK Inspiration Fund

This fund will provide a total annual investment of up to £250,000 to cover five research projects. It is designed to support innovative projects that meet patients' unmet needs and help them achieve a better quality of life. These projects must aim to reduce MSK pain, improve function, reduce healthcare costs and improve quality of life. They must involve patients (or data linked to patients) with bone, joint or muscle conditions, must be evidence-based and take place in the UK.

It is open to orthopaedic surgeons, scientists and physiotherapists.

The Ronald Furlong Fund

This annual fund of £100,000 is designed to support the development of one innovative and commercially viable idea from a UK-based start-up that solve the unmet needs of society around bone, joint and muscle wellbeing. The chosen idea must be backed by evidence-based research or include the development of such research and be supported by business and financial plans.

It is open to passionate and driven start-ups with game-changing ideas.

Our peer review principles and process

As a member of the Association of Medical Research Charities (AMRC), we have implemented the five principles of the peer review when considering potential research projects:

1. Accountability - Charities must be open and transparent about their peer review procedures and publish details, including the names of members of scientific advisory committee (SAC) or other decision-making bodies.

2. Balance - SAC must reflect a fair balance of experience and scientific disciplines.

3. Independence - the SAC must be independent of the charity's administrative staff and trustees.

4. Turnover - SAC members must have a fixed term of office and not have tenure,

5. Impartiality - SAC must include a significant number of non-beneficiaries. There must be a conflict-of-interest policy and potential beneficiaries should not be present when decisions are made.

Our review process involves four separate stages before we award our research grants:

1. Internal triage by the Research Committee - We check the eligibility of research applications to ensure they are within scope. We assess the basic quality of research at this stage - this is done by experts.

2. Written peer review - experts from the UK and around the world provide written comments on the research application. We generally require at least two written reviews.

3. Scientific Advisory Committee - made up of independent experts, the committee meets on behalf of the charity to discuss each application and the written peer review comments. The committee makes independent and impartial funding recommendations to the charity.

4. Board of Trustees - make the final decision on whether the charity should award funding to the research application. Sometimes this decision making is delegated to the Research sub-committee, but all trustees are kept informed of the research review activity.

Case studies

Musculoskeletal tissue engineering

Dr Jennifer Paxton runs a research lab at the University of Edinburgh, focussing on musculoskeletal tissue engineering, in particular methods to engineer bone tissue, tendon tissue and the bone-tendon interface.

We have funded two of her projects – the first was for a PHD studentship to investigate tendon repair and in particular the connections that the tendon has with the bone and how this interface, especially for people who had suffered sports injuries, could be made stronger to withstand the pressures and the stresses of activity. Working with a hand surgeon, Dr Paxton's team researched the design of a bespoke tissue engineered implant.

The second project explores the role of mechanical stimulation in impacting the interface between bone and tendon. Dr Paxton's team is working with engineers to build a bioreactor system to mimic the movement of muscle contraction to see if they can get more of an anatomical interfacial structure to be formed, including cartilage, which will be the key to make these tissue engineered structures a lot more like the native anatomy.

According to Dr Paxton, *'ORUK has been very supportive of early career researchers like me. It has been wonderful to have support from people that put faith in you and your ideas, rather than always going for the big, established groups with the track record. I would not be in the position I am now, had it not been for the continued funding from ORUK.'*

Guiding sarcoma surgery

We are funding a research project, led by Dr Kenny Rankin, Consultant Orthopaedic Oncologist and Honorary Senior Lecturer at Newcastle University, to test the effectiveness (in laboratory conditions) of a new fluorescent antibody-dye combination to guide surgeons operating on sarcoma patients.

The antibody-dye, which is more specific than is currently available, is intended to provide surgeons with the ability to identify more precisely the bone, muscle and tissue that is directly impacted by a tumour. This enables the surgeons to remove only what is essential and reduce the musculoskeletal damage to the patient. The

dye is added to an antibody, using a special chemistry technique developed by James Knight (research group leader and lecturer in radiochemistry in the School of Natural and Environmental Sciences at Newcastle University), that allows it to bind specifically to the cancer cells.

The project has performed well in a laboratory setting and the team is now in discussion with third parties about scaling up production of the antibody prior to its use in early-stage patient trials.

Dr Rankin says, *'ORUK was the perfect partner for this project because it focuses on the treatment of people facing the most extreme musculoskeletal challenge - reducing the impact of orthopaedic surgery on sarcoma patients.'*

Developing a pioneering guide for spinal surgery

We are in partnership with a team from UCL to research the design and development of surgical guides for spinal surgery for the treatment of scoliosis, especially for young children.

Scoliosis, or curvature of the spine, affects 1-3% of children under the age of 10. It requires a highly complex surgical procedure that involves placing screws into the spine to an extremely high level of accuracy. Even when undertaken by very experienced consultant surgeons, the risks of spinal cord damage are significant, especially when operating on children whose vertebrae are so small.

The UCL team of material engineers, clinicians and radiologists is developing a bespoke surgical guide customised to the body shape of each patient, to help spinal surgeons achieve a high level of accuracy when placing screws into the spine. The design of the surgical guide begins with a preoperative C.T. scan of a patient, which the surgeon uses to determine the precise placement and trajectory of the spinal screws. This is then 3D printed to create a bespoke polymer guide for each patient. It has the potential to benefit many patients, not just in the UK but around the world and especially in developing countries where surgeons may be less experienced.

This use of the guide will also reduce the number of x-rays or C.T. scans required to check every stage of the procedure – these are currently undertaken preoperatively, intraoperatively and postoperatively to check the accuracy of each screw placement, leading to high level of intraoperative radiation. Studies have indicated that children undertaking these procedures are at a very high risk of cancer because of this heavy exposure to radiation.

The interdisciplinary project team is working with clinicians and patients, to ensure its real-world application and has reached the pre-clinical stage, gathering the data required prior to the first in human clinical trial. If successful, it will be the first time that such a product has been available for UK patients with highest

level of safety and efficacy data. The team is also developing advanced imaging techniques based on MRI (black MRI) rather than C.T scans, reducing still further the risk of radiation, working with the artificial intelligence team within UCL.

Dr Deepak Kalaskar, Associate Professor of Bioengineering at UCL, who is leading the project says, *'Without the seed funding from ORUK we would not have got to the stage when we are thinking about getting their first in-man trial and have secured the second round of funding. They are playing a big role in the development process and connecting us to sources of funding with the aim of ultimately sharing in our success when, as we hope, the product is clinically validated.'*

Investing in our future movement

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