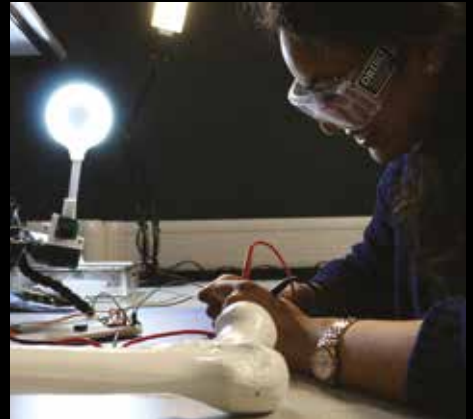


Bournemouth
University

ORIBU

Orthopaedic
Research Institute
Bournemouth University

Response to Covid-19





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Welcome to **ORIBU**



Professor Robert Middleton
Head of Orthopaedic
Research Institute

In a normal year, you would be expecting to read the latest ORI BU Annual Report. This however, is anything but a normal year. Covid-19 has affected all our lives. ORI BU therefore thought that our response to Covid-19 would be a more important update for our readers. This issue describes the incredible things the team have done to mitigate the effects of Covid-19.

Our staff were redeployed to the local hospitals. This included involvement in testing Covid-19 samples, vaccine trials, organising Poole Hospital's response to the pandemic, virtual reality surgical training and the reallocation of our hip fellows to trauma wards. Patients suffering from osteoarthritis were not forgotten. Education and exercises classes previously delivered in the physiotherapy department or gym were moved online.

A series of self-help videos was also produced and made available to the public.

All of our clinical trials continued in a modified form, responding to Covid-19 restrictions. Our grant applications and

written research continued, and we enjoyed much success in the form of grants awarded and papers published.

Finally, we welcomed the merger of the Royal Bournemouth, Christchurch and Poole Hospitals to form University Hospitals Dorset NHS Foundation Trust. A University Hospital in Dorset combining clinical care, research, education and professional standards – what a positive way to end the year.

Professor Middleton redeployed as Medical Commander at Poole Hospital

In April 2020, Professor Robert Middleton, Head of ORI, was redeployed to Poole Hospital NHS Foundation Trust.

With elective surgeries suspended, Professor Middleton was appointed as one of the Medical Commanders at Poole Hospital. When there is a serious incident, hospitals appoint Medical Commanders to respond to the emergency. For example, they oversee organising extra staff, equipment, or blood supplies. Each Commander is available 24 hours a day, to respond to any changes that require medical decisions, in order to provide a safe and effective service for patients.

“For over twenty years, I’ve done the same job every day of the week, and around 90% of my work has been with patients, either operating or seeing them in the clinics, or doing ward rounds,” says Professor Middleton. “That changed entirely and, as Medical Commander, 100% of my work involved management and organising a response to the pandemic.

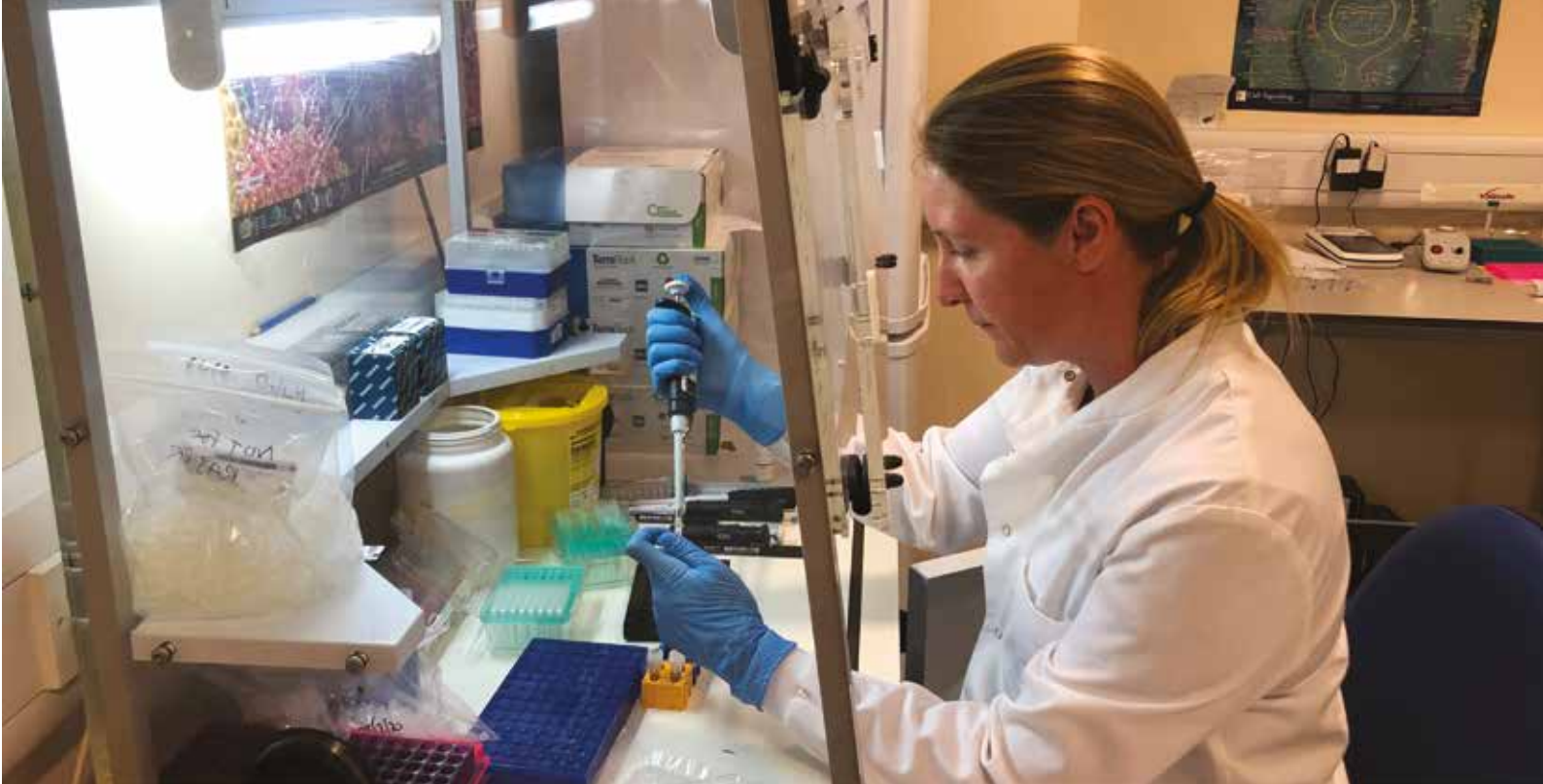
I took it in turn with the other medical commanders to be in the incident room for twelve hours a day, where with the Nursing Commander and Management Commander, we responded to problems as they arose. We provided a presence on site during the day, and then overnight we were available on call. I am extremely lucky to have some very good colleagues to work with, and everyone pulled together to ensure the hospital ran smoothly.

It was great to be able to support the doctors and nurses on the front line and to make sure they had all the equipment they needed to do their job.”



“It was great to be able to support the doctors and nurses on the front line and to make sure they had all the equipment they needed to do their job.”

Professor Robert Middleton



Erika Parkinson redeployed to test Covid-19 samples

CLEAT trial manager Erika Parkinson joined the Molecular Pathology Covid-19 testing team at The Royal Bournemouth Hospital.

Erika joined ORI as Trial Manager for the CLEAT study in May 2019, an NIHR funded randomised controlled trial comparing a cycling and education programme (CHAIN) with usual physiotherapy care in the treatment of hip osteoarthritis. With the CLEAT trial on hold during the pandemic, and with vast laboratory skills, Erika was soon recognised as a member of staff who could contribute to testing Covid-19 samples at The Royal Bournemouth Hospital.

“With the CLEAT trial on hold, and with my background as a scientist, I volunteered to help with the Covid-19 testing at the Royal Bournemouth Hospital,” says Erika.

“ I feel proud to be doing something that helps. I have skills that can be useful during this pandemic, so it’s nice to know I can do something of value. ”

Erika Parkinson

“I started in Immunology and was later reallocated to the Molecular Pathology Covid testing team.”

With planning now underway to re-start the CLEAT trial, Erika has returned to ORI. Nonetheless, she has continued to support the team at the Royal Bournemouth Hospital by assisting with the delivery of the Covid-19 vaccine research studies being undertaken at the Dorset Research Hub. The Dorset Research Hub is one of over 30 sites across the UK recruiting participants to the Novavax phase III coronavirus vaccine study.

Erika says: “I feel proud to be doing something that helps. I have skills that can be useful during this pandemic, so it’s nice to know I can do something of value.”



Virtual reality surgical training for NHS staff

To respond adequately to the high volume of patients with Covid-19 requiring admission to hospital, healthcare services have been required to restructure.

Most hospitals adopted a consultant-led trauma service, with elective orthopaedic services being cancelled. To limit the risk to medical personnel, only essential surgical staff had access to the operating theatres. As a result, already limited

training opportunities further diminished, especially for junior doctors and trainee surgeons.

Virtual reality surgical simulators are at the forefront of innovation in medical education. Their use has increased in recent years in an attempt to counteract the downward trend of decreased trainee surgical activity and to improve patient safety. These simulators are a validated platform that provide risk-free hands on surgical experience and improve the proficiency of trainees prior to undertaking these procedures on patients.

The facilities at ORI are world-class and include the only virtual reality lab in the world to offer both Virtamed and OSSIM simulators. These facilities create a rich

learning environment for both trainee and experienced surgeons, looking to enhance their surgical skills.

With the closure of university campuses in the UK, we transferred our VirtaMed ArthroTM surgical simulator to the Harbour Hospital, Poole, to provide a novel training opportunity for medical students, junior doctors, trainee surgeons and middle-grade surgeons. Eighty training sessions were conducted by three fellowship-trained surgeons on the VirtaMed ArthroTM knee, hip and shoulder modules. Participants were taught basic arthroscopic skills before undertaking training modules on diagnostic arthroscopy.

Supporting patients with osteoarthritis during the suspension of routine surgery

During Covid-19, elective surgeries, such as hip and knee replacements, were cancelled to make bed space for patients requiring admission to hospital due to Covid-19. In addition, many physiotherapy services cancelled face-to-face appointments, instead providing advice remotely. With gyms and leisure centres closed, many patients with musculoskeletal conditions were required to self-manage their symptoms at home.

In both the early and later stages of osteoarthritis, self-management strategies can help to control symptoms such as pain and stiffness. During the first lockdown we published a series of videos offering advice on self-managing hip osteoarthritis at home, which were created using extracts from the CHAIN programme.

The advice is based on the latest evidence from the National Institute for Health and Care Excellence (NICE) guidelines for the treatment of osteoarthritis, that recommends exercise (local muscle strengthening and aerobic training), education and weight loss where necessary. The videos are delivered by our CHAIN team, which consists of experts from ORI and the Royal Bournemouth Hospital. The series includes advice on exercising with hip osteoarthritis, pain medications, diet and nutrition, assistive devices and alternative therapies.

Associate Professor Tom Wainwright says: “Due to the suspension of face-to-face outpatient physiotherapy, and the closure of the Littledown Leisure Centre, we have paused our CLEAT study. We know that there will be many patients locally who may be suffering from hip pain, and so we prepared these short education videos that we hope will be helpful for patients.



“ With little time or resources, the two teams have come together to support people with arthritis in these challenging times and produced some very useful videos. ”

Professor Robert Middleton

We are also signposting suitable online exercise programmes and resources from the ORI website”.

Professor Robert Middleton says:

“The collaboration between Bournemouth University and the NHS has been brilliant. With little time or resources, the two teams have come together to support people with arthritis in these challenging times and produced some very useful videos. I highly recommend viewing”.

The videos can be accessed on our YouTube Channel (Orthopaedic Research Institute, Bournemouth University).



Covid-19 electrical stimulation research

Professor Ian Swain, Associate Professor Tom Wainwright and Louise Burgess have been working with an international group of experts to investigate the role of neuromuscular electrical stimulation (NMES) to improve the recovery of critically ill Covid-19 patients admitted to the intensive care unit.

NMES has long been an area of research for ORI, and the opportunity to apply this expertise at a time where innovations are needed was welcomed. Their article, submitted to the Journal of Rehabilitation Medicine, highlights the role of NMES for weaning patients off ventilators, reducing muscle atrophy and preventing thrombotic complications.

The review examines the evidence, current guidelines, and proposed benefits of using NMES with patients admitted to the intensive care unit. Practical recommendations for using electrical muscle stimulation with Covid-19 patients are provided and suggestions for further research are proposed.

Burgess LC, Venugopalan L, Badger J et al. Could neuromuscular electrical stimulation improve the recovery of people with Covid-19 who require care in the intensive care unit? A narrative review. JRM.



Covid-19 mask research

Throughout lockdown, the ORI team have been working remotely, providing an opportunity to contribute to the evolving Covid-19 evidence base.

Professor Swain has published the results of a home-testing protocol, looking at the effectiveness of masks in preventing the spread of respiratory diseases. Since the start of the pandemic, there has been much debate in the media on whether masks should be worn to stop the spread of the virus.

Professor Swain measured the change in relative humidity when wearing a mask, compared to no mask, in various scenarios, based on the assumption that as the virus is air-borne, the smaller the increase in

humidity, the less the spread of the virus. The results suggest that the use of a mask, excluding some simple home-made ones, significantly reduces the spread of humidity. However, their effectiveness is device specific and needs to be considered in greater detail for each type of mask.

Swain ID. Why the mask? The effectiveness of face masks in preventing the spread of respiratory infections such as COVID-19 – a home testing protocol. J Med Eng Technol 2020.



Recovery after Covid-19

Associate Professor Tom Wainwright and Consultant Physiotherapist Matthew Low have published two articles on the rehabilitation of patients with Covid-19.

The first, “Beyond Acute Care: Why collaborative self-management should be an essential part of rehabilitation pathways for Covid-19 patients”, published in the *Journal of Rehabilitation Medicine*, highlights the importance of collaborative self-management during rehabilitation.¹ The second, “Why the biopsychosocial model needs to be the underpinning philosophy in Rehabilitation pathways for patients recovering from Covid-19”, published in the *Integrated Healthcare Journal*, discusses the biopsychosocial model in the context of Covid-19.²

Tom Wainwright and Louise Burgess have published guidance for exercise specialists working with Covid-19 patients looking to return to physical activity.³ The review aims to guide exercise professionals on the late-stage recovery from Covid-19 and highlights important physiological and psychological considerations for individuals who seek advice on returning to physical activity and exercise.

Tom Wainwright has also published an article looking at how Enhanced Recovery after Surgery (ERAS) should be implemented following the Covid-19 pandemic. The article highlights how implementing the quality improvement method will help to manage the large volume of patients requiring joint replacement surgery once regular operating resumes.⁴

Finally, Claire Forbes, ORI KTP Associate, was successful at helping partner company, HRV Fit, secure a Covid-19 grant from Innovate UK. The project, titled ‘Using daily Heart Rate Variability measures to identify the onset and severity of Covid-19’ aims to investigate the relationship between symptoms of Covid-19 and Heart Rate Variability.



- ¹ Wainwright TW, Low M. Beyond Acute Care: Why collaborative self-management should be an essential part of rehabilitation pathways for Covid-19 patients. *JRM* 2020.
- ² Wainwright TW, Low M. Why the biopsychosocial model needs to be the underpinning philosophy in Rehabilitation pathways for patients recovering from Covid-19. *J Integr Med* 2020.
- ³ Burgess LC, Wainwright TW. Rehabilitating clients following Covid-19 illness. *Fitpro* 2020.
- ⁴ Wainwright TW. Enhanced Recovery after Surgery (ERAS) for Hip and Knee Replacement—Why and How it Should be Implemented Following the Covid-19 Pandemic. *Medicina* 2021.

An update on ORI research studies

In March 2020, the UK government recommended working from home where possible to reduce the spread of Covid-19. Higher education institution campuses, and schools were closed to mitigate risk, and elective surgeries, such as hip and knee replacements, were cancelled to make bed space for patients. Research studies across the world were suspended so that research staff could focus on delivering rapid trials in Covid-19.

Robotic total hip replacement (The HELLO trial)

ORI is pioneering the research into robotic total hip replacement surgery by launching an observational study to evaluate the health outcomes from a Mako-Robotic-Arm assisted total hip replacement (the HELLO trial) in collaboration with Nuffield Health Bournemouth. Compared to other methods, the Mako robotic assisted hip replacement is the most accurate and consistent method for placement of the hip components.

The study aims to recruit 100 participants undergoing hip replacement surgery. As of March 2020, when the World Health Organisation declared a global pandemic, 81 patients had enrolled onto the study. HELLO trial manager Dr Ferraro was required to pause recruitment, and instead of inviting participants to the ORI labs for gait analysis and strength assessments, had to follow up participants remotely. Dr



Ferraro contacts the participants by telephone to check on their progress and collects data on adverse events and patient reported outcome measures. The good news is that Nuffield Health Bournemouth have restarted elective surgeries, although currently working at a reduced capacity. Recruitment for the trial will continue as soon as lockdown restrictions allow.

Comparing Physiotherapy Treatment with Cycling and Education to Help Improve Hip Pain (The CLEAT trial)

In February 2020, we launched The CLEAT study, a randomised controlled trial investigating whether people who receive an 8 week education and static cycling treatment (The CHAIN programme) have an improvement in their hip function and less pain than those patients who receive physiotherapy treatment as per standard care and practice within the NHS.

With leisure centres closed and face-to-face physiotherapy limited, the CLEAT trial was placed on hold, however the study will resume as soon as Covid-19 restrictions allow in 2021.

Augmented reality for total hip replacement simulation

Last year, Mara Aguilera Canon successfully defended her PhD entitled “Machine learning and augmented reality for total hip replacement simulation”. Mara, who collaborated with ORI and the National Centre for Computer Animation, is now working as a virtual reality/augmented reality system developer at BU. Mara’s role involves developing a patient-fitted AR experience for anatomical examination.

Associate Professor Tom Wainwright says: “I am delighted that Mara has been awarded her doctorate, she has worked extremely hard and made a valuable contribution to the field of virtual reality surgical training.”

New research studies

Tracking physical activity after hip replacement surgery

ORI is interested in why some patients recover better from joint replacement surgery than others. 2021 will see the launch of a study delivered in collaboration with Professor Henrik Kehlet of the University of Copenhagen and Professor Mike Reed at Northumbria Healthcare NHS Foundation Trust to examine physical activity after patients have had total knee replacement surgery.

Participants will be asked to wear activity monitors before and after surgery so that the research team can identify factors which may determine changes in physical activity following surgery. The research will launch early in 2021, and take place at Northumbria Healthcare NHS Foundation Trust, an exemplar Trust in patient recovery following the adoption of Enhanced Recovery after Surgery (ERAS) pathways.

Evaluating the performance of new hip replacement prosthetics

For many years, ORI has been involved in the evaluation of new hip replacement prosthetics, collaborating with the Royal Bournemouth Hospital.

These studies involve assessing the clinical performance of different acetabular cups and femoral stems, whilst also assessing adverse events related to the implant. During the pandemic, the remote follow of patients involved in these research studies has continued, and ORI has been successful in securing a new project with ZimmerBiomet which will start in 2021.



Innovative Transfer Board study, funded by Innovate UK

ORI is working on an Innovate UK funded project in partnership with Buckingham Healthcare, a local designer and manufacturer of healthcare related products.

The project aims to produce an innovative transfer board to increase the independence of patients with limited ability and reduce the burden to carers and healthcare services. ORI has been providing expertise in the design and development of the prototype using their specialist labs; and also engaging with users, carers and clinicians to get feedback on the device during its development. A second application to Innovate UK has been made for further funding to extend the work. The project will continue once lockdown restrictions are lifted.





New publications

Aside from research into Covid-19, the ORI team have used their time away from the labs to publish findings from research studies conducted prior to the pandemic.

In June, we published the latest results from the CHAIN (Cycling Against Hip Pain) programme, delivered between February 2018 and September 2019 in collaboration with The Royal Bournemouth Hospital and BH Live.¹ As per previous evaluations; data from 167 patients with hip pain demonstrated improvements to function, pain, quality of life and motivation to exercise following participation in the programme.

The publication of our findings is well-placed, with the Government recently announcing a £2 billion package to encourage people to cycle rather than driving or taking public transport, making healthier habits easier and relieving the pressure on public transport. The package includes a voucher scheme to help get bikes fixed and back on the roads, creating higher standards for permanent cycling infrastructure, and encouraging GPs to prescribe cycling and exercise. It comes following research from Public Health England that found excess weight can increase risk of serious illness and death from Covid-19. At ORI, we have been prescribing cycling for hip osteoarthritis for over seven years, with many patients

benefiting from making long-term lifestyle change and incorporating cycling into their daily routine.²

We have also published a feasibility randomised controlled trial, investigating neuromuscular electrical stimulation (NMES) for preventing thrombotic complications following hip replacement

surgery.³ This work has informed our review of the role of NMES in critically ill Covid-19 patients and provides important findings for clinicians looking to increase blood flow, reduce oedema and prevent thrombotic complications in hospitalised patients.





Tom Wainwright and Shay Bahadori have published an experimental methodology on lower limb biomechanical analysis using the GRAIL system and the Primus RS dynamometer, two of the latest technologies available to measure the lower limb biomechanics of individuals.⁴ Shay Bahaodri continues to lead the way in advancements in the area of wearable technology and smartphone apps in orthopaedics, publishing a systematic review of the current commercial technology used to monitor individuals following hip replacement.⁵

Associate Professor Tom Wainwright co-authored an editorial in the *British Journal of Anaesthesia* with internationally renowned colleagues Professor Henrik



Kehlet from Copenhagen University and Professor Stavros Memtsoudis from the Hospital of Special Surgery in New York.⁶ The editorial summarises the current state and future challenges for day case and Enhanced Recovery pathways in hip and knee replacement. Importantly it highlights that peri-operative teams should be mindful that the ERAS concept

is based on reduction of undesirable pathophysiological responses to surgery in order to enhance recovery, meaning 'first better, then faster'.

Most recently, Tom Wainwright has co-authored the ERAS Society guidelines for the perioperative care of patients undergoing lumbar spinal fusion, with a multidisciplinary team of experts from across the globe. The consensus statement includes a comprehensive analysis of the available literature, and provides evidence-based recommendations for lumbar fusion surgery for degenerative spinal conditions.⁷

¹ Wainwright TW, Burgess LC, Immins T, Cowan N and Middleton RG. A cycling and education intervention for the treatment of hip osteoarthritis: A quality improvement replication programme. *SAGE Open Med* 2020.

² Wainwright TW, Burgess LC, Immins T, Middleton RG. Self-management of hip osteoarthritis five years after a cycling and education treatment pathway. *Healthcare* 2020.

³ Wainwright TW, Burgess LC, Middleton RG. A Single-Centre Feasibility Randomised Controlled Trial Comparing the Incidence of Asymptomatic and Symptomatic Deep Vein Thrombosis Between a Neuromuscular Electrostimulation Device and Thromboembolism Deterrent Stockings in Post-Operative Patients Recovering from Elective Total Hip Replacement Surgery. *Surg Tech Int* 2020.

⁴ Bahadori S, Wainwright TW. Lower Limb Biomechanical Analysis of Healthy Participants. *J Vis Exp* 2020.

⁵ Bahadori S, Williams J, Collard S, Swain ID. A review of current use of commercial wearable technology and smartphone apps with application in monitoring individuals following total hip replacement surgery. *J Med Eng & Tech* 2020.

⁶ Wainwright TW, Memtsoudis SG, Kehlet H. Fast-track hip and knee arthroplasty... how fast? *BJA* 2020.

⁷ Debono et al. Consensus statement for perioperative care in lumbar spinal fusion: Enhanced Recovery After Surgery (ERAS) Society recommendations. *The Spine Journal* 2021.



ORI opens first global hub in Cape Town, South Africa

Last year, ORI was delighted to sign a memorandum of understanding with the University of Cape Town (UCT), making it the first of the planned ORI global hubs. UCT is among the top ten universities in Brazil, Russia, India, China and South Africa (the BRICS countries) and is consistently the top-ranked university in Africa. ORI plans to work on a range of research projects with South African colleagues in the future, and collaborative work has already started during the pandemic period.

Associate Professor Tom Wainwright assisted colleagues remotely with quality improvement expertise in order to optimise throughput within the Covid-19 testing facility at Groote Schuur Hospital, and has acted as an external clinical

expert for postgraduate research degree interviews. In addition, he has also been invited to collaborate with Dr Ulla Plenge (Consultant Anaesthetist at Groote Schuur Hospital) on her national project to implement Enhanced Recovery after

Surgery for hip and knee replacement, and has a publication in preparation with Associate Professor Delva Shamley (Head of Clinical Trials Unit at UCT).

An update on the Dorset LEP funding

ORI's work in developing innovative practice and training surgeons nationally and internationally has been supported by two awards of funding from the Dorset Local Enterprise Partnership (LEP).

Work has been continuing on the second awarded project – Global Gateway – throughout the year. This includes the purchase of state-of-the-art research equipment for the ORI labs; and the development of a Virtual Reality robotic hip replacement demonstrator; a digital platform for training surgeons on robotic hip replacement surgery; and an online portal to facilitate the management of project data across ORI and its global hubs. These digital solutions enable ORI to maintain its national and international reach in these times of the Covid-19

pandemic, and increase significantly benefits to patients, hospitals and the wider communities. ORI is pleased to have been recently awarded some additional money by the LEP to extend the development of the digital platform, so that more ORI projects can be delivered remotely.



University Hospitals Dorset

In 2020, we saw the merge of Poole, Bournemouth and Christchurch Hospitals in what we now know as University Hospitals Dorset NHS Foundation Trust.

Since its inception in 2015, ORI has worked closely with our regional hospitals, conducting joint research projects, service improvement work and providing professional development opportunities for staff. The university hospital status, given to University Hospitals Dorset NHS Foundation Trust, formalises the relationship between Bournemouth University and the hospitals, and the work of ORI was used to support the application.

ORI has a number of staff who work between the university and the hospitals through visiting positions, committee memberships and joint appointments. This includes Professor Robert Middleton, a Consultant Orthopaedic Surgeon and Director of Trauma at University Hospitals Dorset, and Head of ORI at BU.

He comments: "After many years in the planning, Dorset now has a University Hospital. The merger of clinical services

allows Dorset to provide a unified health service and world class care that is recognised with the awarding of university status. This is an opportunity for all of us in healthcare, research and education to work together to develop something special here in Dorset."



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