



Uned Ymchwil Arennol Cymru Wales Kidney Research Unit



Raising awareness



Disseminating results



Teaching students



Engaging with public and patients



Learning about kidneys



Ymchwil Iechyd
a Gofal Cymru
Health and Care
Research Wales



Ariennir gan
Lywodraeth Cymru
Funded by
Welsh Government

2023 - 2024 Annual report



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F O R E W O R D

Welcome to the 2024 Public Report of the Wales Kidney Research Unit (WKRU). This report encapsulates another year of dedicated research, patient care advancements, and community engagement in our ongoing mission to improve kidney health and treatment outcomes in Wales and beyond.

Over the past year, WKRU has continued to spearhead innovative research initiatives, collaborate with leading health professionals, and engage with patients and communities to better understand and address the complexities of kidney disease. Our efforts are guided by a commitment to excellence in research, patient-centred care, and the dissemination of knowledge to improve both clinical practices and public health policies. In 2024, our research has made significant strides in several key areas, including the early detection and prevention of kidney disease and its complications, the testing of novel therapeutic approaches, and the enhancement of patient care protocols. You'll read about some of the highly talented researchers doing this work here.

The WKRU remains steadfast in its goal to foster a collaborative research environment. Each year, we aim to provide a "deep dive" into one or more of the key parts of this work. This year, we have highlighted the critically important role of biobanking. Here there are many unsung heroes that make the biobank work in the background. This includes the staff performing the biobanking activities, and also those patients, public and

staff who give up their time to review activities and decide on authorisations for research proposals.

We have also highlighted trials of new treatments and other similar activities across Wales that are bringing new treatment options to patients. Through these, the WKRU membership are making a major contribution to the global effort to improve treatments for kidney disease and are increasing the options that people affected by kidney disease in Wales have for their treatment.

Training, dissemination and engagement are the other cornerstones of our activities that you will read about here. In the WKRU, we recognise how critically important it is to give everyone the opportunity to understand research and to get involved. If you have ideas or requests in these areas, we want to hear from you!

As we reflect on the progress made in 2024, we also renew our commitment to advancing kidney research and improving patient outcomes through scientific excellence, innovation, and community engagement. We thank our dedicated researchers, healthcare professionals, patients and families, commissioners, and all of our partners and supporters for their contributions and dedication to our shared mission. Together, we are making strides towards a future where kidney disease is better understood, better treated, and ultimately, better prevented. Thank you for your continued support and interest in the work of the Wales Kidney Research Unit.

The only Biomedical Research Unit in the UK funded to focus solely on Kidney Disease

450,000 people in Wales have Chronic Kidney Disease (CKD) Stages III-V (less than 50% of kidney function remaining) and that places them at a greatly increased risk of death and cardiovascular illness.

10,000 people are under follow up in renal secondary care, including 2,000 people dependent on Renal Replacement Therapy (RRT) to keep them alive.

The WKRU is built on internationally recognised research in each step of the translational pathway, from fundamental disease mechanisms and better diagnosis, to improved implementation and health outcomes.

The WKRU research successes are informed by and involve patients, families and carers, service providers and service commissioners, as well as researchers.

WKRU SENIOR TEAM AND CORE STAFF



UNIT DIRECTOR
Prof Donald Fraser

BANGOR



**Social Care
Research Lead**
Prof Jane Noyes*



Research Officer
Dr Leah
McLaughlin*

CARDIFF



Unit manager
Dr Chantal Colmont



Research Assistant
Dr Irina Grigorieva*



**Outreach and
Dissemination Lead**
Dr Robert
Steadman*



Research Assistant
Dr Shrinivas Dighe



Research Technician
Paolo Rosario*

SWANSEA



CIPHER link Lead
Dr James Chess*

*Staff supported by
multiple funders

Our Mission:

To bring benefit to the population of Wales and further afield, through delivery of collaborative, multi-disciplinary research that answers important renal health and social care problems.

Strategic objectives:

-Improve the infrastructure supporting kidney research in Wales.

-Involve stakeholders (patients, families and carers, service commissioners, service providers, as well as researchers) in planning and undertaking research, and dissemination of findings and subsequent **improvements in practice**.

-Build a portfolio of research funded by external awards at all stages of the pathway from basic research to healthcare delivery, resulting in **research with impact**.

-Build a portfolio of industrial partnerships in research projects leading to **changes in activity**.

-Engage with the public to raise awareness of kidney disease, its clinical and social effects and **share the findings of our research**.

WKRU MEMBERSHIP

The membership of the WKRU is based in three Centres around Wales: Bangor University, Cardiff University, Swansea Bay UHB Hospital/Swansea University.

Administration

Kim Abberley

Bangor: Social Care

Emma Jones
Leah McLaughlin
Jane Noyes
Jamie Hugo-Macdonald

Swansea

Owain Brooks
Christopher Brown
James Chess
Luke Davies

Cardiff: Laboratory and Clinical Research

Elijah Ablorsu
Mohammed Al-Talib
Argiris Asderakis
Jessica Baillie
Timothy Bowen
Rowan Casey
Esra Cetin
Rafael Chavez
Shrinivas Dighe
Matthias Eberl
Siân Griffin
Irina Grigorieva
Shivaram Hegde
Ian Humphreys
Simon Jones
Usman Khalid
Mario Labéta
Farah Latif
Soma Meran
Anne-Catherine Raby

James Redman
Steve Riley
Paolo Rosario
Shrea Roy
Dan Smith
Tanya Smith
Robert Steadman
Michael Stevens
Bnar Talabani
Phillip Taylor
Alexa Wonnacott
Aeliya Zaidi

Tissue Bank Governance

Timothy Bowen
Rafael Chavez
Donald Fraser
Bob Hall
Simon Jones
Usman Khalid
Leah McLaughlin
Soma Meran
Pam Parkhouse
Anne-Catherine Raby
Stephen Riley
Hywel Thomas

Patient Focus Group

Mair Clarke
Lesley Cole
Muriel Coombs
Bob Hall
Jackie Holder
Gloria Owens*
Pam Parkhouse
Joanne Popham
Margaret Parry
Geraint John
Helen Williams
Janet Williams*



SUMMARY

**KIDNEY DISEASE
IS OFTEN SILENT IN
ITS EARLY STAGES**
WITH NO OBVIOUS SYMPTOMS

Why a Wales Kidney Research Unit?

Kidney disease is common and often silent. 15% of the UK population have Chronic Kidney Disease (CKD) but half will not be aware of their diagnosis and so will not be taking measures to slow progression and avoid future morbidity. Renal Replacement Therapy consumes 2% of

the NHS budget, or £120 Million p.a. in Wales. The NHS in Wales, therefore, needs to understand the service pressures and how best to meet them.

The WKRU helps meet these challenges by providing core infrastructure, enabling patients, families and

carers, third sector organisations, service providers, service commissioners, industry partners, and researchers to explore important renal health and social care questions, and to develop state of the art services that benefit the population needs.

Who benefits from the Unit's work?

Patients and carers

Advise and participate in research studies to improve outcomes for patients.

Contribute to the wider service improvements of care in Wales and beyond.

Get involved, get in touch

The WKRU invites all patients, carers and members of the public to get involved with the design, delivery and dissemination of our research. In our quarterly **Involvement in Research Design** meetings we discuss grant ideas, each focusing on one aspect of kidney disease. The project is explained in detail in lay terms and a knowledge of science isn't necessary. We believe it is essential that patients and carers inform our research ideas. In Cardiff, we also regularly open our laboratory to the public.

More details at:
<http://kidneyresearchunit.wales/en>
You can also watch the [video](#) "WKRU: a day in the life" to see what we do.

To get involved in our research please email colmontcs@cf.ac.uk or wkru@bangor.ac.uk or call 02921848469.

Researchers

Connected to other stakeholders, ensuring that the research questions will improve the health and social care of kidney patients.

Health and Social Care Professionals

Help direct research activity towards goals with impact beyond advancing knowledge.

Commissioners

Connect with other stakeholders to advance a prudent healthcare agenda.

Who is in the unit?

The Wales Kidney Research Unit has members from every Renal Unit in Wales.

Studies of population-scale health outcomes data have the potential to transform NHS services, and the WKRU is working with the Swansea-based world-leading SAIL (Secure Anonymised Information Linkage) Databank to develop this capacity. In addition to laboratory and clinical research taking place in Cardiff, researchers in Bangor are focusing on social care aspects and wellbeing of renal patients.

Core Metrics

Reporting period: **2023/2024**

Uned Ymchwil Arennol Cymru
Wales Kidney Research Unit

**Health and Care
Research Wales
infrastructure award
to the group**



Direct
funding
awarded

£258,723

Jobs created
through direct
funding



Grants won during reporting period

Grants won	Led by group	Group collaborating
Number	10	5
Value	£1,135,189	£545,608
Funding to Wales	£1,135,189	£300,383
Funding to group	£1,089,829	£88,308
Additional jobs created for Wales	5	2
Additional jobs created for group	5	1



Number of publications



Number of public
engagement events



Number of public
involvement opportunities

Biobanking metrics



Consents



Research
requests



Research
requests
approved



Samples
issued to
research
projects



Projects
receiving
samples



Publications
using samples

WORK PACKAGES

WKRU activity is organised into five work packages



WP1. MANAGEMENT

WKRU management is robust, democratic, efficient and responsive to opportunities and challenges. Activity is overseen by the Welsh Government Health and Care Research Wales Infrastructure grants-management team. The WKRU reports to them on a quarterly basis with additional financial reporting mid-year, and a full annual progress report.

WP2. RESEARCH INFRASTRUCTURE

Our researchers are based in Cardiff, Swansea and Bangor Universities, and the NHS with WKRU members in all dialysis units in Wales.

We work closely with Kidney Research UK (KRUK), the principal UK funder of renal research, and Professor Tim Bowen sits on the KRUK Research Grants Committee.

Professor Siân Griffin is General Secretary of the Transplantation Society, NIHR specialty lead for Wales, an executive board member of the UK Organ Donation and Transplantation Research Network and member of the KRUK Research Grants Committee.

The WKRU underpins the Wales Kidney Research Tissue Bank, which includes samples from patients recruited locally, nationally and internationally.

BIOBANKING

The purpose of the Wales Kidney Research Tissue Bank (WKRTB) is to serve as a repository of samples donated by patients and healthy volunteers for use in studies advancing the prevention, understanding and care of kidney diseases.

What is a tissue bank?

This is an organisation that collects and stores biological samples (tissue, blood, urine etc...) and data, and makes them available to researchers to learn more about how diseases start, develop and how to treat them. The WKRTB collects such samples and supports research into kidney and related diseases by making anonymised samples available to scientists involved in such research.

Who reviews the tissue bank?

Before any work and collection of tissue can start, the tissue bank submits documentation for review by a Research Ethics Committee to ensure that all rules and regulations are followed, in particular Human Tissue Authority ones. All processes are reviewed and renewed every five years.

How is it regulated?

Access to tissue and any personal data that may be associated with it, is strictly controlled. A formal request to use the WKRTB samples and the planned research must be reviewed and approved by the Tissue Bank Governance Committee. In order to do research with human tissue, researchers need to collect information from patients' medical records and record details of diagnosis tests. All personal information is kept confidential and anonymous by linking data to samples by the team and only anonymised data is released to researchers.



2023-24 activity

710 samples were collected by WKRTB. Those samples are whole blood, serum, plasma, Peripheral Blood Mononuclear Cells (PBMC, which are the white blood cells), urine, kidney biopsies and dialysis fluid.

What happens to the tissue?

Many people get involved to help recruit patients and collect samples, at Cardiff University and the NHS. Samples are collected during routine hospital visits and can either be processed and used immediately or stored at low temperature to be released to researchers later (students, post-doctoral (post doc) fellows, senior scientists and clinicians) and can be used for various types of research.

What type of research is conducted?

Many different types of research rely on the use of human tissues, including DNA work. They can be used to develop new tests to help diagnose diseases or can be used to help develop new ways to treat or even cure diseases. Some of the research may lead to new medical products, such as diagnostic tests and drugs, or new procedures.

One important aspect of tissue banking work is maintenance of equipment and safeguarding of samples. Most of the WKRTB samples are stored in -70°C freezers. WKRTB currently has 8 freezers, some of them over 20 years old, which are onerous to replace and energy-hungry. Mindful of limiting energy consumption and aware of quality of samples released for research, it is important to review collections and evaluate their potential future use.

Therefore, it is sometimes necessary to discard samples, when they have been extensively used and partially used up and their quality decreases with time and freeze-thaw cycles, where tissue degrades as it's being thawed. In 2023, some samples from a 21 years old study were discarded. This allows to free storage space and get new samples as research and technic evolve.

BIOBANKING ACTIVITY 2023-24

Over the last year, the WKRTB has seen its activity increase with new studies adopted and collecting samples (summary of WKRTB activity on p7 & 9). To prepare for further studies and research, several amendments, requesting new types of samples to be collected, were submitted and approved by the Research Ethics Committee. This will allow additional work to be carried out, with new projects in transplant and peritoneal dialysis research.

To inform patients who have generously gifted samples, WKRU produced a newsletter detailing some ongoing research, projects which use samples from WKRTB and study two viruses – cytomegalovirus (CMV) and BK virus (also known as *Human polyomavirus 1*). These are both very common, and people without a transplant may not even know they have had an infection. However, after a transplant, the drugs that stop rejection mean an infection can be more serious.

Ms Rowan Casey

I am a new PhD student just starting my project looking at the effects of a nutrient called arginine on our immune system. In some haemodialysis and transplant patients, arginine levels become extremely low, which we think means parts of their immune system have low responses. I am testing this, and whether supplements can recover the immune system. This will boost vaccine responses and help fight chronic infections. I am working with blood samples from three patient groups, looking at CMV and how well the Covid-19 vaccine works. By the end of my project, we hope to have enough evidence for a clinical study looking into the effect of arginine supplements.

Dr Mohammed Al-Talib

I am a doctor and starting a project looking at BK virus. I am collecting and storing blood and urine samples from kidney transplant patients from the day of their transplant, and at regular intervals over 1 year. I will compare samples between people who did and did not develop BK virus infection. I will look for differences in immune responses against the virus. This work could ultimately change how we monitor and treat BK virus infection and help us predict who is at risk of developing the infection early.



Edward, Lauren and Farah

Dr Edward Wang Dr Lauren Kerr-Jones

One part of the immune system that is important in controlling CMV is the Natural Killer or NK cell. We are looking at the different types of NK cell and CMV virus in kidney transplant patients. This is to see whether different types of NK cell and virus are more likely to cause worse infection. We hope this information will let us predict patients who will or won't get CMV disease. This means we will know who will need more treatment and who will need less.



Rowan and Mohammed

Dr Farah Latif

I am a doctor and I have just finished my PhD project. After infection, CMV doesn't go away but remains hidden. During my PhD studies I investigated how CMV is controlled by people with transplants. Cytokines are messengers of the immune system. I have looked at how these stop the virus, and how the virus changes how much cytokine is made. I have found a cytokine that can predict CMV infection and how long it takes for patients to get the virus under control. I hope this will help develop new treatments.

WORK PACKAGES

WP3. RESEARCH ACTIVITY: HIGHLIGHT

Answering Renal Research questions:

Acute Kidney Injury (AKI)
Chronic Kidney Disease (CKD)
Renal Replacement Therapy – Dialysis and Transplantation
Social care

During the last year, the Unit has been involved in 13 clinical trials investigating these research areas in partnership with the

Nephrology and Transplant Directorate at Cardiff and Vale University Health Board and other areas of the NHS in Bangor and England. The Cardiff lab supports 2 interventional and 12 observational trials, with 9 receiving laboratory support for sample processing. One hundred and ninety-nine patients were recruited in those studies over the last year.



In the United Kingdom, as in most other developed countries, the demand for organ donation exceeds the supply of organs, leading to many dying each year whilst on an organ donation waiting list. England had been debating for some time whether to switch to an opt-out system of consent as a way to address this issue. Following Wales, which had introduced a 'soft' opt-out policy into its National Health Service (NHS) in 2015, a bill was passed in England in 2019 creating a similar system of consent. Alongside this, the role of the family changed. While families remain essential to deceased organ donation by providing information to health care professionals to maintain the safety and effectiveness of organs for transplant, they are no longer the decision makers. Instead, families are required to support the organ donation decision their relatives made in life.

The Policy Innovation and Evaluation Research Unit based at the London School of Hygiene & Tropical Medicine was commissioned by NIHR to undertake an evaluation of the implementation of the changes, in partnership with WKRU members, headed by Professor Jane Noyes and Dr Leah McLoughlin at Bangor University. The work has now been completed and was submitted to the Department of Health in December 2023. The research will be used to update the resources used by nurses for information and is available @ <http://www.healthtalk.org/> It is hoped that it will bring change in policy and practice.

Each chapter of the report forms a research article, and all have now been submitted for publication.



The Challenge

CKD is a devastating condition that has a huge impact on the quality and length of life. The ideal management for kidney failure is a kidney transplant, however, the availability of organ transplants is limited, and it is not always a suitable treatment option. As a result, many people with kidney failure rely on life-saving dialysis treatments. 'Haemodialysis' (HD) is the most commonly used dialysis therapy in the UK, and in most cases, is an 'in-centre' treatment, that takes place at a hospital-based or satellite dialysis unit. Although HD is a life-saving treatment, people still experience intrusive symptoms, limitations on their daily life, and ultimately their lives are shortened because of the kidney failure. Most in-centre HD treatments are organised three times a week, around four hours per session, with additional travel time either side. There is growing evidence that increasing HD treatment time is beneficial for overall health and well-being. Unfortunately, increasing treatment time during the day is limited by hospital schedules and the large number of people needing HD.

The Research (Aims and Objectives)

'In-centre nocturnal HD' refers to overnight treatment at a hospital or satellite dialysis unit for six to eight hours, three times a week, almost doubling the total amount of HD per week. Receiving HD overnight also keeps the daytime free for people with kidney failure. The NightLife study is the first clinical trial

across the UK to robustly investigate in-centre nocturnal HD. This study asks the question whether six-months of overnight dialysis, performed three times a week in a hospital or satellite centre, improves the quality of life of patients with kidney failure, as compared to those who have shorter dialysis sessions during the day.

Plan of investigation

The study is funded by the National Institute for Health and Care Research Health Technology Assessment Programme. Since January 2020, the study recruits adult patients who have been on HD for over three months, from 18 HD units across England, Scotland, Wales and Northern Ireland (UK). It will run until December 2024. Ysbyty Gwynedd is the first hospital in Wales to take part in the trial, which involves participants being randomly allocated to receive either: night-time HD (with sessions lasting between 6 and 8 hours, in-centre, 3 times per week), or standard care (daytime dialysis, with sessions lasting between 3.5 and 5 hours, in-centre, 3 times per week), for 6 months.

The study will measure patients' quality of life, their patient experience, clinical parameters like blood results and medications, and cost-effectiveness for the National Health Service (NHS).

Further information about the study can be found on the study's website:

<https://nightlifestudy.co.uk/>



Impact

At Ysbyty Gwynedd, six patients (five male and one female), are taking part and are already feeling the benefits. All six are now having their dialysis for eight hours, three times a week at night-time, instead of four hours, three times a week during the day. There are also four patients who are receiving day dialysis as part of the trial, which allows researchers to compare both groups.

Consultant Nephrologist at Ysbyty Gwynedd, Dr Abdulfattah Alejmi, says nocturnal dialysis has so far given patients an overall improved sense of wellbeing, with more time available during the day to socialise, work and care for others.

Patient Hajar Al Ghabari, 26, from Bangor came to live in North Wales around three years ago after fleeing the war in Syria. Having been diagnosed with kidney disease

in her teenage years, she is now waiting for her second transplant after a previous transplant failure. Since joining the trial, she said her quality of life has massively improved. "When I receive my treatment in the day I feel a lot more fatigued and I suffer from headaches so having my treatment during the night when I'm asleep has made such a huge difference to me. I have a lot more awareness during the day now, I can go and spend time with my friends and family and I feel so much more energetic – I feel like I've got my life back," she added.

In addition, several academic articles have been published that are already triggering further interest and research in this important area. You can find them [here](#).

IMPORTANCE OF INCREASED PARTICIPATION IN CLINICAL TRIALS

Challenge

Historically, low levels of engagement with international multicentre trials in Wales meant that kidney patients have limited access to the innovative treatments and have been unable to contribute to testing and developing new therapies.

Research

Concerted effort from triallists in centres including Cardiff, Swansea and Bangor has led to a step change in international trial activity involving Welsh Centres.

Results

Welsh kidney patients have contributed to the highest impact studies in the field, published in leading journals including The Lancet and New England Journal of Medicine.

Impact

Trials have included those of new therapies now introduced in practise such as flozins. These are reducing kidney and heart risk for kidney patients worldwide. Increased familiarity of Welsh clinical teams with new drugs as a consequence of increased trial activity has led to more rapid adoption, accelerating the benefit of effective new therapies. WKRU collaborators have contributed to a number of those trials, including PROTECT, EMPA-KIDNEY, DAPA-CKD and DUPLEX.



Photo by National Cancer Institute on Unsplash

Welsh Investigators have also helped develop national guidelines eg. UK Kidney Association Clinical Practice Guideline: Sodium-Glucose Co-transporter-2 (SGLT2) inhibition in adults with kidney disease 2023 update, published in [BMC Nephrology](#).

Wales' participation in these international efforts to improve kidney care is recognised by the international research community, for example Prof Donald Fraser chaired the American Society of Nephrology High Impact Clinical Trials Session at the American Society of Nephrology (ASN) 2023 in Philadelphia, with an estimated 12,000 delegates. The increased profile that Wales has because of the contribution of Welsh kidney patients to these studies makes Wales a likely choice for inclusion in studies testing future therapies. An example of this is shown on the next page.

IMPACT OF CLINICAL TRIALS

WKRU collaborators are contributing to several clinical trials. One of them is *Avacopan for the Treatment of ANCA-associated vasculitis*

The Challenge

Vasculitis is an autoimmune condition in which small blood vessels become inflamed, resulting in damage to organs. The kidneys are particularly susceptible. Standard treatment includes drugs to suppress the immune system (usually Rituximab or cyclophosphamide), together with steroids. Steroids have a number of side effects, ranging from acne, weight gain, mood disturbance and insomnia, to diabetes, gastritis and osteoporosis. Patients who need treatment for longer periods are more likely to develop side effects.

The Research (Aims and Objectives)

The Cardiff Renal Unit was one of several sites worldwide who recruited to a clinical trial studying an alternative treatment to steroids, called avacopan. The WKRU lab supported the processing, storage and shipping of samples from trial participants.

Results

Avacopan was more effective than steroids - patients went into remission sooner, had fewer side effects and their kidney function one year later was better. The results have been published in leading medical journals, the *New England Journal of Medicine* (Avacopan for the Treatment of ANCA-Associated Vasculitis. Jayne DRW, Merkel PA, Schall TJ, Bekker P; ADVOCATE Study Group. *N Engl J Med.* 2021 Feb) and the *Lancet* (The impact of treatment with avacopan on health-related quality of life in antineutrophil cytoplasmic antibody-associated vasculitis: a post-hoc analysis of data from the ADVOCATE trial. Vibeke Strand, David R W Jayne, Audra Horomanski, Huibin Yue, Pirow Bekker, Peter A Merkel; ADVOCATE Study Group. *Lancet Rheumatol.* 2023).

Impact

Avacopan has been evaluated by the National Institute for Health and Care Excellence (NICE) and is now available to treat patients. Cardiff is contributing to a follow up study collecting further information about patients with vasculitis.



Photos from Unsplash

WORK PACKAGES

WP4. TRAINING

This year the Cardiff lab has been joined by one full-time PhD student, four SSC (Student Selected Component) medical students and two Professional Training Year students from the School of Bioscience, all undertaking laboratory-based projects. We also have one

student carrying out data analysis for a Master's degree.

We have had four students awarded their PhDs, covering research into inflammation in kidney disease, calcium deposition in blood vessels, techniques for improving kidney

preservation before transplantation and blood vessel damage following inflammation in dialysis patients. Two of these students are currently continuing their clinical training while the others are pursuing a research career.

Bangor University

WKRU researchers in the School of Health Sciences in Bangor University are providing an immersion opportunity for an Early Career Researcher to be part of two projects: One project involves producing a module on organ donation under the new opt out system for HealthTalk online – the database of patient experience. This dissemination work is a direct result of our recent evaluations of the opt out legislation in England and Wales. The second project is an initial analysis of NHSBT records as to why parents say yes or no to paediatric organ donation. This is the first study of its type, and we hope it will lead onto a larger study. Professor Jane Noyes in Bangor also mentored a renal nurse, who wishes to do preliminary research, in order to submit an Advanced Fellowship Application to get funding to carry out a full research project.

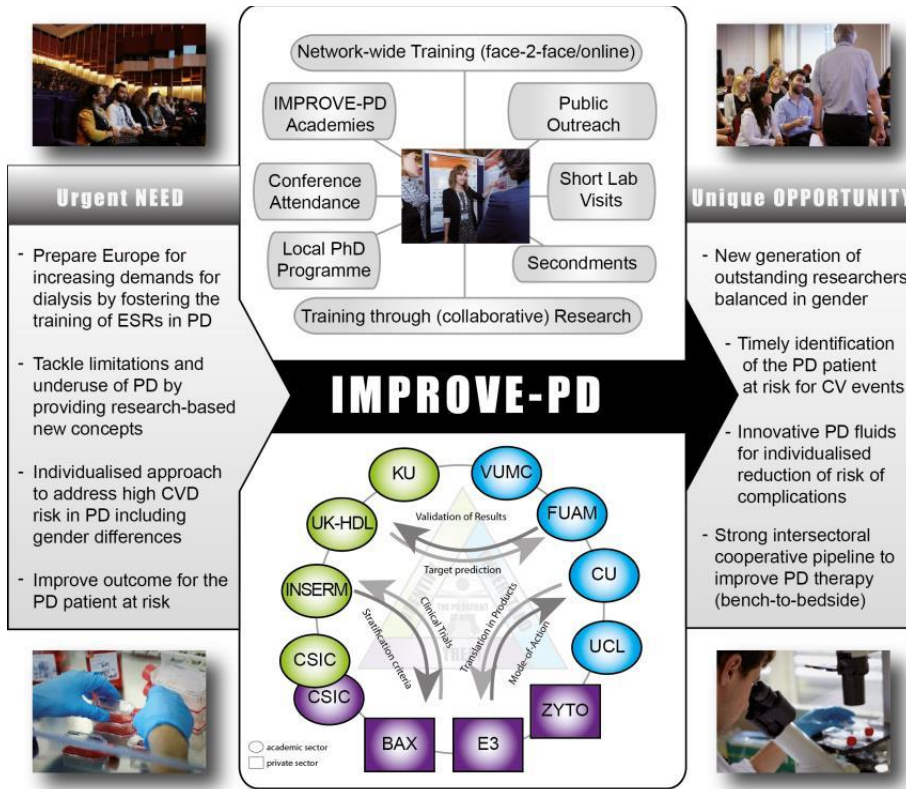
Also in the School of Health Sciences in Bangor University, Dr Leah Mc Laughlin is a member of a PhD student steering committee and expert advisory group in Queens University, Belfast. PhD student Megan Cairns says: *"I am a first-year PhD student in the School of Nursing and Midwifery at Queen's University Belfast. My supervisors are Dr Clare McKeaveney and Professor Helen Noble. I am also a renal patient and have received a kidney transplant. I am currently working on a research project seeking to improve sexual health awareness and reduce the stigma of sexual health issues in renal health care. My project is entitled Understanding how to improve sexual health awareness and reduce the stigma of sexual health issues for chronic kidney patients, their partners, and renal healthcare professionals"*

Dr Shrinivas Dighe, WKRU Research Associate in Cardiff, has been awarded an Associate Fellowship of the UK Higher Education Academy. Associate Fellowship is the appropriate category of fellowship to professionally recognised individuals from a wide variety of different backgrounds whose higher education (HE) teaching

and/or support for learning practice has reached appropriate and effective levels of core knowledge and professional values in teaching and/or support of learning. The panel noted: *"This is an interesting portfolio that showcases your development and growth as an educator since engaging*

with the Associate Fellowship Programme. You demonstrate effective teaching practices using a range of pedagogical approaches, showcase an understanding of a range of appropriate literature, and evidence a commitment to uphold professional values as set out in the UK Professional Standards Framework. Well done."

WORK PACKAGES



Urgent NEED

- Prepare Europe for increasing demands for dialysis by fostering the training of ESRs in PD
- Tackle limitations and underuse of PD by providing research-based new concepts
- Individualised approach to address high CVD risk in PD including gender differences
- Improve outcome for the PD patient at risk

Unique OPPORTUNITY

- New generation of outstanding researchers balanced in gender
- Timely identification of the PD patient at risk for CV events
- Innovative PD fluids for individualised reduction of risk of complications
- Strong intersectoral cooperative pipeline to improve PD therapy (bench-to-bedside)

IMPROVE-PD PHD PROGRAMME

Peritoneal dialysis (PD) is a life-saving treatment for end-stage kidney disease patients of all ages. While PD offers benefits over haemodialysis (HD), both treatments accelerate vascular disease and cardiovascular problems compared to pre-dialysis patients. In PD patients, there's a high risk of inflammation-driven cardiovascular disease, strongly linked to mortality.

Understanding the molecular mechanisms involved in PD-related inflammation and its connection with cardiovascular outcomes can help design interventions to reduce these risks.

The IMPROVE-PD consortium brought together international researchers to understand inflammation-driven cardiovascular disease in PD patients, develop personalised risk identification methods, and test new therapies. This program involved 15 young scientists across 11 institutions in 7 countries in a PhD training program in Europe. WKRU hosted two scientists, Esra Cetin and Shrea Roy, who researched disease pathways and calcium deposition in blood vessels.

Esra's project highlighted specific damage pathways contributing to blood vessel inflammation and blockage in CKD and proposed therapeutic approaches to reduce these issues. Shrea's research on Hyaluronan, a large carbohydrate, found in all tissues, showed its potential in protecting against blood vessel damage by uncovering specific mechanisms during vessel damage development.

In 2023, both Esra and Shrea were awarded PhDs for their work. Esra is now following up her work as a postdoctoral fellow with her PhD supervisor, Dr Anne-Catherine Raby, while Shrea has taken a postdoctoral position in Purdue University, USA.

Shrea Roy: *Hyaluronan (HA)-regulation of vascular smooth muscle cell phenotype and vascular calcification in CKD*



Esra Cetin: *Mechanisms of Vascular Damage Following Bacterial Peritonitis in Peritoneal Dialysis Patients*



WORK PACKAGES

WP4. TRAINING

At the WKRU, we encourage non-scientists to undertake research projects. Emma Jones is a nurse from North Wales who started a PhD at the School of Medical and Health Sciences, Bangor University, to try to answer the following question:

**Why do people say “no” to a kidney transplant?
Understanding patient decision-making and choice.**

Introduction

Kidney transplantation is considered the ‘best’ kidney replacement therapy for people with end stage CKD, improving quality of life, when successful, providing freedom from dialysis, and reducing co-morbid complications associated with being on dialysis. However, little is known about the reasons why some people with kidney disease decline kidney transplantation when they are otherwise medically suitable. The aim was to develop an in-depth understanding of the lived experiences of people living with kidney disease, their experiences of decision-making and the reasons which led them to decline a kidney transplant.



Emma Jones @Emma33653404 • Jan 27

We are inviting people with kidney disease to share their views on the reasons for declining the opportunity to have a kidney transplant.

Please retweet or forward on to anyone who may be suitable. Thankyou

Get in touch with Emma
mmj20cpp@bangor.ac.uk



We are conducting a study to understand why people say ‘no’ to a kidney transplant?

**Why do people say ‘no’ to a kidney transplant?
Understanding patient decision making and choice. A constructivist grounded theory study**

We are interested to hear more about you, your views, attitudes, and experiences that led to your decision not to have a kidney transplant

@KidneyWales @kidneycareuk
@NKF_UK @KPIN_UK #kidneytransplant

Study advertisement on social media, with partner organisations and on the WKRU website

Methods

Thirty people were recruited from six regional nephrology units within the United Kingdom and by advertising on kidney network social media. Individuals were eligible if they had declined a kidney transplant whilst otherwise being medically suitable to receive one. Interviews were recorded, transcribed and analysed.



Findings

Emma conducted 30 interviews (11 females, 19 males, aged 34 to 83 years old), including all kidney replacement modalities (People not on dialysis CKD stage 4 and 5, HD in-centre and satellite unit, Home HD, Nocturnal Home HD, Continuous Ambulatory Peritoneal Dialysis, Automated Peritoneal Dialysis, 3 participants had been previously transplanted).

People have formed social understandings of what they consider the best kidney replacement treatment for them. Negative perceptions and pre-conceived ideas about kidney transplants, regardless of age, gender, or treatment type, influenced their decisions. Many believed they would be worse off and assumed a transplant would fail. Older participants often felt they were too old for a transplant and believed younger people would benefit more.

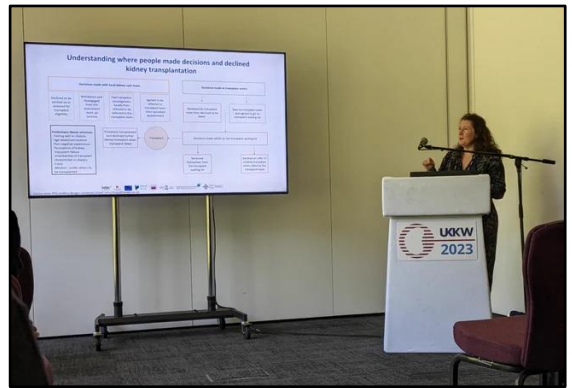
People with CKD stages 4 and 5, who felt well and had no symptoms, were reluctant to make decisions. Those adjusted to dialysis and leading a normal life, seeing others living long lives on dialysis, found it reassuring and less burdensome compared to the uncertainties of a transplant.

Negative experiences and fear of hospitals affected participants' well-being and decision-making. During COVID, those diagnosed with end-stage kidney disease or who started dialysis felt unsupported and unprepared to make transplant decisions.

People felt pressured to consider living kidney transplants. Three participants had been on the transplant list but refused a donated kidney due to inconvenient timing or wanting the kidney to go to someone else. Those who refused or removed themselves from the transplant list reported feeling relieved.

Discussion

This study is one of the first to explore reasons for declining kidney transplantation. People's social constructions of what was the 'best treatment' for them often conflicted with clinical practice recommendations aimed at increasing transplant numbers to improve outcomes. Understanding people's perspectives is crucial for developing future policies based on better shared decision-making.



The methodology and findings of the study were discussed and reported at several events and conferences, including UK Kidney Week 2023, the WKRU Annual Meeting and the European Dialysis and Transplant Nurses Association/European Renal Care Association (EDTNA/ERCA) 2023.



With Kidney Wales at UKKW 2023

This work has led to one publication so far: Qualitative Evidence Synthesis published in [BMJ Open](#).

WORK PACKAGES

WP4. TRAINING



Anna Gaspar, an undergraduate medical student, was a Masters student for a short period in 2023-24 and carried out a research project, sponsored by the B.D. Williams Scholarship, using samples collected in the Wales Kidney Research Tissue Bank to carry out specific analysis related to COVID19 and vaccination in kidney patients.

THE ROLE OF ARGINASE METABOLISM ON T CELL RESPONSES TO COVID VACCINATION IN IMMUNE COMPROMISED RENAL PATIENTS

Background

CKD often results in poor immune function, making patients more susceptible to infections, hospitalisations, and increased overall health risks. The mechanisms causing this immune dysfunction in CKD are not well understood. One hypothesis suggests that CKD leads to higher breakdown of an amino acid called L-arginine by the enzyme arginase 1, causing L-arginine deficiency. This deficiency can impair the proliferation and activation of specific immune cells. This study aimed to investigate how blood levels of arginase 1 affect the immune response to the SARS-CoV-2 spike protein.

Methods

Patients on HD provided blood samples every three months over a year. We measured their serum arginase 1 levels, SARS-CoV-2 spike protein-specific immune responses, and anti-SARS-CoV-2 antibodies.

Results

We found two groups within our patient cohort: those with consistently high or low arginase 1 levels. High arginase 1 levels were linked to a significantly impaired immune response to the SARS-CoV-2 spike protein. However, most patients (85%), regardless of their arginase 1 levels, were able to generate an antibody response after two vaccine doses.

Conclusion

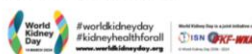
High levels of arginase 1 are associated with a reduced immune response. Further investigation is needed to understand the reasons behind this variation in arginase 1 levels and will need to be confirmed in larger studies. Our findings so far, however, suggest that L-arginine supplementation may improve immune responses in patients with end-stage renal disease.

Anna explains: *"I carried out this project as part of my dissertation for my Master's in Immunology from June to September. I only spent 10 weeks in the labs, so this was a relatively small project, but we're hoping to keep going with it, and my work has provided some preliminary data that we're hoping to build upon in upcoming projects."*

WORK PACKAGES

WP5. DISSEMINATION AND ENGAGEMENT

The WKRU aims to disseminate its work to patients and public to improve communication and collaboration between researchers and service providers to coordinate research and delivery to patients.



WORLD KIDNEY DAY 2024

For **World Kidney Day (WKD) 2024**, the WKRU raised awareness about Kidney Health for All through social media posts and messages from the international steering committee promotion: “Kidney Health for All: Advancing equitable access to care and optimal medication practice”. WKRU participated in the #showyourkidney campaign and supported the messages of local charities: Kidney Wales and Popham Kidney Support. In Cardiff, the WKRU raised awareness and promoted kidney research to public and patients at the Heath Hospital.



SCIENCE IN HEALTH LIVE 2024



The WKRU joined 9 other groups from Cardiff University School of Medicine for the annual Science in Health Live event in March 2024. The event allows Year 12 and 13 pupils from secondary schools all over Wales to visit laboratory and clinical groups within the School of Medicine and learn about the cutting-edge research being carried out.

About 400 pupils attended the event from over 30 schools and colleges across Wales and the South-West. On a tour of the WKRU labs the students were shown a variety of techniques used to investigate the causes and mechanisms of kidney disease.

INVOLVEMENT IN RESEARCH DESIGN

Several researchers presented their projects to groups of patients who are members of the Popham Foundation, to give them some opportunities to get involved with the WKRU research. Researchers attended the Popham Peer Mentor Supervision monthly

meeting to discuss some of the ongoing research. Patients may be intimidated to get involved with research and those discussions allow people to get more familiar and comfortable to give their views.

Feedback from kidney patients having heard about research projects in kidney transplantation:

"Having professionals present their research is amazing." "Anything that can be done to avoid a biopsy." "It's only through research that those changes can be done." Shaun

"I do find it very interesting what is going on in the background." Mair



"It seems to be a very worthwhile project aimed at improving the results from transplantation and looking at specific elements of the process which cause problems so I wish them every success and hope they get what they need either financially or adequate resources to carry on." Bob

DONATION COMMITTEE ACTIVITY

As a result of the WKRU outreach and general dissemination activities, the Unit receives regular donations to conduct research. To manage this fund, we have created a dedicated governance committee including WKRU principal investigators and two lay representatives,

with the aim of supporting early career researchers. The committee has met twice in 2023-24 to discuss research projects from post-doctoral applicants. The committee received 4 applications and funded 4 for a total amount of £36,242. The funds requested were to develop specific models and obtain preliminary data which will be used towards grant applications.

PATIENTS AND PUBLIC INVOLVEMENT EVENT TO DEVELOP A SHARED DECISION-MAKING TOOL FOR WOMEN WITH CHRONIC KIDNEY DISEASE

Where we are now?
“Women don’t know what they don’t know”

Women need high quality shared decision-making interventions embedded as routine in a feminised care pathway that includes reproductive health. Research is needed in parallel to examine the effectiveness of interventions and address inequalities.

ADAPT

Adapting interventions to new contexts—the ADAPT guidance www.bmj.com/content/374/bmj.n1679

MyVoice_{CF}
 A reproductive health tool for women with CF

BEFORE
 Begin Exploring Fertility Options, Risks & Expectations

LEICESTER KIDNEY LIFESTYLE TEAM

<https://pubmed.ncbi.nlm.nih.gov/37833123/>

<https://pubmed.ncbi.nlm.nih.gov/31660965/>

<https://www.leicesterkidneylifestyle.team/my-kidneys-me-resources>

Video conference participants: Hall Matthew (Renal), Nadia, Jane Noyes (Staff), Leah McLaughlin (Staff), Deborah Dival, Clare McKeagney, Helen W..., Marisa S...

The Leicester University Kidney Lifestyle Team has developed a website: My Kidneys & Me (<https://www.leicesterkidneylifestyle.team/my-kidneys-me-resources>), to help kidney patients manage their condition.

WKRU researchers, Professor Jane Noyes and Dr Leah McLaughlin are collaborating with the Leicester Kidney Lifestyle Team and Cardiff and Vale University Health Board to develop a shared decision-making tool for women with CKD, to be included on the My Kidneys & Me website.

The research team held a hybrid Public and Patients Involvement (PPI) meeting in March 2024 to gather opinions and recommendations from patients, clinicians, and health researchers for developing a new tool. Participants included women with CKD, kidney organisations, patient support groups, and health professionals such as obstetricians and renal specialists. The meeting had 26 participants (6 virtually), with 9 patients (3 women) and 17 professionals. The meeting was split into two sessions: one

with the research and development team, and another with health professionals, the public, and patients. Dr Leah McLaughlin chaired the sessions, while Professor Jane Noyes coordinated online feedback. This setup allowed for detailed and relevant feedback on the tool.

Different aspects of the tool were presented to highlight its design, content, and use. Both sessions had the same presentation but gathered unique insights from each group's experiences. The presentations enabled collaborative development to assess the tool's effectiveness in helping women with CKD make decisions.

The PPI event improved understanding of shared decision-making for women discussing pregnancy, family planning, birthing, and parenting options with their renal care team. The recommendations and experiences will be integrated into the tool, informing its development, video podcasts, user testing, and dissemination.

MEET MEMBERS OF THE WKRU TEAM

Dr Leah McLaughlin



In 2022, WKRU was awarded 2 years of additional funding for 2023-25 by Health and Care Research Wales. Fifty % of Leah's role is funded by this award as an early career researcher who leads a portfolio of qualitative and Health Services Research

studies in WKRU. Lead for building capacity and capability in (i) PPI contribution to kidney related lab-based, and health and social care research, (ii) outreach activities with an emphasis on translating research outcomes in clinical practice and the public understanding of science. In addition, she is the key liaison for developing capacity and capability in allied health professional research and for development work in North Wales, including integration with and support for the new medical school at Bangor University.

She recently started working with colleagues to investigate Interventions delivering CKD information and education:

Professor Jamie Hugo MacDonald

School of Psychology and Sports Science, College of Medicine and Health, Bangor University. I teach and complete research and impact activities in two distinct areas: i) physical activity to prevent and treat chronic disease; and ii) how to enhance health and performance in high altitude environments.

My clinical collaboration involves supporting the renal unit at Ysbyty Gwynedd to complete research studies and service improvement activities. An example would be including our unit as a recruitment site in the Nightlife trial, the NIHR-

funded study on nocturnal dialysis: <https://nightlifestudy.co.uk/>. I believe we are the first and only in Wales to be in this trial (full study description on p12-13).

I am also part of the Welsh Renal Clinical Network Health and Wellbeing Professionals Group, providing physical activity advice and research support.

We are supervising three Foundation Two medical doctors per year to complete Master of Research degrees, the majority of which are in CKD. We are also supervising one PhD student who is in his writing up period. He is a Specialist Registrar and has recently taken up a post at University Hospital of Wales,

evidence mapping, systematic reviews of clinical- and cost- effectiveness, and a realist synthesis of what works for whom, when, and under what circumstances. Led by colleagues in Leicester this is a national team of investigators. Leah has been accepted on the Welsh Crucible 2024 programme. Welsh Crucible is an award-winning programme of personal, professional and leadership development for the future research leaders of Wales. The programme facilitates and promotes research-inspired innovation and cross-disciplinary collaboration in Wales.

Cardiff as a Nephrologist.

Finally, we are advocating for CKD patients to join the Wales National Exercise Referral Scheme, via my role as Bangor's lead within the Welsh Institute of Physical Activity, Health and Sport.



CONFERENCES

The work of the WKRU has been disseminated in many events and conferences, locally and around the world.

WKRU collaborators, academic scientists and clinicians at all levels of their career path or education attend a variety of events and conferences to disseminate their research results, present new research ideas and discuss with peers, patients and the public.

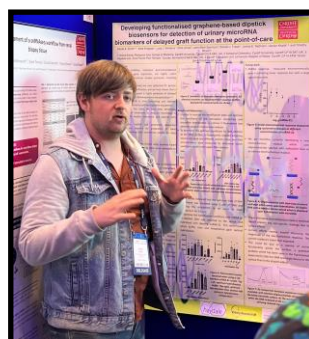
The 14th Conference of the International Society for Hyaluronan Sciences (<https://ishas.org/>), took place from 4th to 8th June, 2023 in Portland, Oregon, USA.

Members of WKRU have been integral to and have presented at the conference since its inception 20 years ago. This year Professor Timothy Bowen (Secretary to the Society) and Dr Soma Meran (both from WKRU) served on the organising committee, and Dr Aeliya Zaidi and Shrea Roy presented their research. This conference is held every 2 years. This year the conference attracted 142 participants from more than 15 countries and featured 53 oral and 43 poster presentations. The conference brings together a wide range of researchers, from molecular-level basic science to clinical researchers, and there were also representatives from 25 industrial and pharmaceutical companies. Both Aeliya and Shrea were awarded travel grants by the society, while Soma has now been elected Vice President, Clinical Sciences Division of the Society.



WKRU Annual Meeting

Our Annual Meeting was held on 27th September, 2023 in Cardiff University's SPARK Building and included 45 lay, scientific and clinical attendees. There were 16 oral presentations by WKRU members on topics ranging from Social Science research such as **“Why do people say “no” to a kidney transplant? Understanding patient decision-making and choice: an interpretative phenomenological study”** (see full study details on p17-18) to Clinical Trials research such as **“Continuous glucose monitoring in peritoneal dialysis”** and basic science research such as **“The use of Toll Like Receptor-derived peptides to boost the immune response of CKD patients.”** There was also an award for the best poster presentation, which was won by Dr Dan Smith.



CONFERENCE IN WALES



UK Kidney week, June 5th-7th, 2023

UK Kidney Week is the annual scientific, educational, and networking meeting of the UK Kidney Association and is renowned for its up-to-date research, state-of-the-art lectures, and diverse symposia, presentations and workshops.

The event provides an exceptional opportunity for all kidney professionals to engage with colleagues, network with experts, and explore the latest research and technological innovations that will shape the future of kidney-related healthcare.

The meeting was held at the International Conference Centre in Newport. In honour of the region, there was a strong Welsh focus in the programme with sessions on shared learning from Wales and from the Wales Kidney Research Unit – connecting early career researchers, patients and the public. The intent was to showcase early career talent within the WKRU and highlight some of the key research activities across Wales, including connection with patients and public.

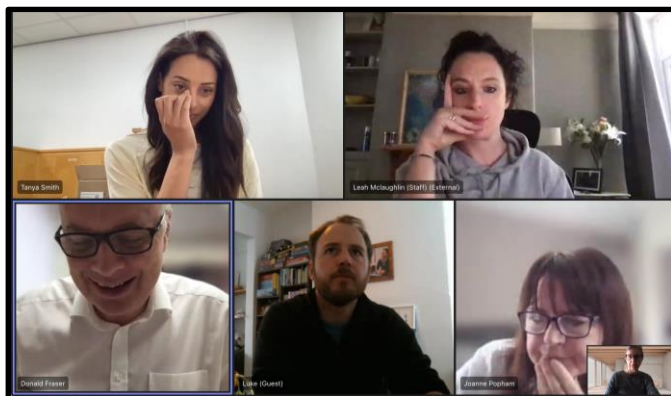
Professor Donald Fraser said: *"UK Kidney Week is the largest UK event for kidney professionals. I am absolutely delighted to see the work of young research stars from Bangor, Swansea and Cardiff Universities, together with the programme of patient and public focussed work led by Popham Kidney Support and the support schemes provided by Health and Care Research Wales being so prominent at this year's meeting. This session will be a fantastic opportunity to hear from Wales' research stars of the future and to hear how to get involved in their work".*

Welsh Health and Social Services Minister: **Eluned Morgan** welcomed delegates and opened the first session of the day. Health and Care Research Wales was represented by **Alex Hills** and **Head of Programmes Michael Bowdery** who presented "Opportunities for early career researchers in Wales." **Michael Bowdery** said: *"We are delighted that UK Kidney Week came to Wales. It is an excellent opportunity to showcase both the work of the Wales Kidney Research Unit, and the funding available to early-stage career researchers through the Health and Care Research Wales Faculty, in this enormously important research field."*

WKRU session contributors



Dr Tanya Smith is an academic anaesthetics trainee who has just been awarded a personal fellowship by Kidney Research UK



Dr Leah McLaughlin has developed a programme of co-productive studies with significant external grant funding

Mrs Joanne Popham is the lead for one of the main kidney-specific charities in Wales (Popham Kidney Support) and her presentation was "Better together: patient involvement in research"

In all there were another 24 oral and poster presentations by members of the Unit. The other speakers were from the three HEI's that contribute to the WKRU (Bangor, Swansea and Cardiff Universities)

Dr Luke Davies was a PhD student with us, then went to the National Institutes of Health in America on a Wellcome Trust Fellowship before returning to Cardiff. He has since been appointed as a new lecturer in the Department of Biomedical Sciences, Swansea University

CONFERENCES AND AWARDS

WKRU was well represented at **EuroPD**, (Bruges, October 2023), a biannual European conference around peritoneal dialysis research, with talks and poster presentations from collaborators at Bangor, Cardiff and Swansea Universities. In particular, there was an overview of the IMPROVE-PD programme (p15), with presentations from all PhD students and supervisors.



WKRU collaborators also attended the **American Society of Nephrology** annual meeting (Philadelphia, November 2023), the largest and most prestigious international renal meeting. Members of the Unit both organised and chaired sessions with presenters in both oral and poster sessions. Professor Jane Noyes was a keynote speaker and session leader around coproduction and patient

involvement: '**Nothing about us without us**' - **PPIE and Co-productive research** – and how can coproduction enhance our shared decision-making tools. Discussions were also around equity in PPIE and PPI in lab-based research with guidance and examples and why people with kidney disease need to be able to share their views in ways that contributes to the evidence.

At the **International Society for Quality of Life Research** (ISOQOL) meeting, (Calgary October 2023), Dr Leah McLaughlin was learning all about Quality of Life measures, with a wonderful global and inclusive network of researchers. She presented: '**Getting the best from your NHS**' (study publication available here: <https://pubmed.ncbi.nlm.nih.gov/37105686/>)



The 2023 meeting of the **South West UK RNA Club** was held in the School of Medicine, Cardiff University on 22nd June. The aim of the Club, founded in Nov. 2006, is to promote collaborative links, information and reagent exchange between researchers interested in RNA biology in the southwest of the UK. It is open to specialists and non-specialists alike; PhD,

MSc and BSc students are particularly welcome. This annual Spring meeting rotates between Bristol, Bath, Exeter and Cardiff and there is strong participation from further afield. The Cardiff meeting was organised by Professor Tim Bowen and Dr Dan Smith with 89 registrants. There were 18 oral presentations and 6 of them were from WKRU.

In March 2024, for **#BritishScienceWeek**

Kidney Research UK acknowledged 30 of their most recent doctors, allied health professionals, professors, and researchers who have been awarded a grant or made a breakthrough in research all related to kidney disease. Two of them, Dr Soma Meran (top) and Dr Farah Latif (bottom right), are WKRU members, while collaborators in Bristol were also featured (from right to left: Prof Gavin Walsh, Moin Saleem and Richard Coward).



British Transplantation Society 2024

Sasha Moore is a nephrology trainee and presented the DEFINE Study (Determining outcomEs in Failing traNsplanted kidnEys) in the Dragons' Den session at the BTS (British transplant Society) Annual Congress 2024.

We know that approximately 800-1000 kidney transplants fail in the UK each year. We know this is an extremely challenging time for patients with a kidney transplant, but we have very little research to guide us on the best management strategies and the wider optimal approaches for supporting patients. We are interested in conducting a study to understand why patients with failing kidney transplants start dialysis when they do (we know it is earlier than patients with native

kidney failure, but we don't know why), how and why medications are changed and how other medical conditions influence decision-making.

The project concept won the Dragons' Den session for [#DEFINEstudy](#) as both first physician & first Welsh winner. The aim is to make the study a UK-wide, multi-centre study led by Cardiff, and we are currently at the stage of study design. We are keen to work with patients throughout every stage of the study and would greatly value any input on the study's aims and the outcomes we're looking to assess.

Sasha said he was "delighted to win [#BTS2024](#) Dragons' Den at BTS 2024" and got "really useful feedback from the Dragons" He would "recommend the experience to anyone."

Sasha also presented the study at the WKRU PPI focus group, where one attendee said: "It seems to be a very worthwhile project aimed at improving the results from transplantation and looking at specific elements of the process which cause problems, so I wish them every success and hope they get what they need either financially or adequate resources to carry on." Sasha has now been appointed to the Welsh Clinical Academic Track & to ST4 Renal Medicine, ranking 3rd at national selection.



CONCLUSION

Thank you for your interest in our work and for giving this report your attention. If you'd like to find out more, if you would like to get involved, or if you have a new idea about work that we should do to understand and improve things for people affected by kidney disease, we'd love to hear from you! You can reach us in lots of different ways - our contact details are on the last page.

Professor Donald Fraser

Uned Ymchwil Arennol Cymru Wales Kidney Research Unit



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