Flinders UNIVERSITY

Flinders Cancer Research

Study with us

flinders.edu.au/cancer

Contents

Welcome

Welcome to the Flinders Health and Medical Research Institute

A research higher degree in FHMRI offers exciting new possibilities. Our new Research Education Hub will deliver programs to enhance your health and medical research training, offer you a range of career-building opportunities and help you develop new skills in a multi-disciplinary environment.

Cancer is one of FHMRI's areas of research excellence, rated at 'well above world standard' by the Australian Research Council's ERA 2018 assessment.

Flinders Cancer Research brings together a dynamic, engaged group of researchers focused on different aspects of cancer - from molecular mechanisms and new treatments, to prevention strategies and best patient care during and after cancer.

Our flagship cancer building is home to research laboratories, clinical and behavioural research facilities and state of the art high tech research infrastructure. Importantly, we share the building with cancer clinicians and patients, and our focus is always on creating a future free from cancer.

This booklet showcases many of the projects being offered in Cancer. I encourage you to contact supervisors and talk to them about your interests and their projects. You are welcome to get in contact with us (cancer@flinders.edu.au) if you would like to look around.

I look forward to welcoming many of you personally if you decide to commence a research higher degree at FHMRI.

Wishing you all the best with the career path you choose.

Prof Ross McKinnon

Director, Flinders Health & Medical Research Institute

Dean (Research), College of Medicine and Public Health

Beat Cancer Professor and Matthew Flinders Distinguished Professor, Flinders University

> *Our focus is always on creating a future free from cancer.*

Flinders Cancer Research

Our vision is a cancer-free future for our communities

At Flinders Cancer Research, we are looking to create **more effective treatments,** achieve **earlier detection and intervention,** and **prevent cancer from developing** in the first place. We also want to help people who have had cancer to get back on their feet physically, mentally and financially.

Flinders Cancer Research is one of the leading research areas of Flinders University*, bringing together research labs, clinical trials and treatment in one flagship facility. We forge connections between more than 150 cancer-focused researchers and clinicians, as well as our patients. We have a shared focus on innovation - on finding new and creative solutions that can make an impact. We are developing innovative solutions to the problem of cancer in our community.

Our members have expertise across a range of disciplines including medicine, surgery, nursing, genetics, molecular and cellular biology, psychology, pharmacology, public health, medical oncology, social work, epidemiology, nutrition, information technology and nanotechnology.

A future free from the impacts of cancer is already being imagined at Flinders Cancer Research and is opening up a world of opportunities.

*Ranked 'well above world standard' by Excellence in Research for Australia (ERA) 2018 in Oncology and Carcinogenesis.

Students at Flinders Cancer Research

Become a Flinders cancer researcher and join our exceptional team.

Whatever your degree, there will be a research training position for you in one of our multidisciplinary cancer research teams. From clinical science, nursing, medical science, psychology and public health, to social science, chemistry, biotechnology, pharmacology and more, there is a project for you.

You will be supervised by leaders in their field and work with researchers and clinicians from other disciplines in a truly collaborative, real-world health and medical environment.

We are committed to educating the cancer researchers of the future; our expert and internationally recognized researchers will mentor you and create tailored opportunities for your career pathway.

This booklet contains projects currently being offered by Flinders Cancer researchers. Feel free to contact them to discuss potential project opportunities for Honours or a higher degree by research (eg PhD).

What is the process for enrolling in Honours or a higher degree by research?

1. Contact the supervisor of interest via email
2. Meet with the supervisor to discuss the project and visit the facilities available for your research
3. Make sure you meet the eligibility criteria for Flinders University (you should discuss this with your potential supervisor as well)
4. For PhD candidates, check out www.flinders.edu.au/study/apply/apply-research-degree
5. Read the information about HDR scholarships at the following link: www.flinders.edu.au/study/apply/apply-research-degree/scholarships-fees
6. Apply!

FOR FURTHER INFORMATION CONTACT:

cancer@flinders.edu.au

> *Surprisingly we still lack fundamental information as to how IGFs and insulin interact with their receptors to promote the key conformational changes required to activate the receptor tyrosine kinase domains and subsequent downstream signalling pathways.*

Proteins in Metabolism and Cancer

Researcher Prof Briony Forbes

Email Briony.Forbes@flinders.edu.au

Research area and interests

The Forbes lab aims to develop novel treatments for cancer through understanding the basic mechanism by which insulin-like growth factors (IGFs) and insulin bind and activate their receptors (the IGF-1R and the insulin receptor) to promote cell growth, survival and metabolic control. Surprisingly we still lack fundamental information as to how IGFs and insulin interact with their receptors to promote the key conformational changes required to activate the receptor tyrosine kinase domains and subsequent downstream signalling pathways. We will probe this interaction by making novel mutants of the ligands and the receptors and then testing these in cell based assays for their abilities to promote downstream signalling. This will allow us to understand in detail which interactions between the ligands and the receptors are key for promoting specific receptor activation outcomes. Ultimately this information will allow us to create novel IGF inhibitors for the treatment of cancers that are dependent on IGF signalling for growth and survival.

Biography

Prof Forbes has had a lifelong quest to understand how insulin-like peptides (including insulin-like growth factors and insulin) normally act to promote cell growth and metabolism.

Her research aims to develop better treatments for diabetes and cancer, diseases arising due to aberrant insulin and insulin-like growth factor signalling. Her work has taken a protein structure/function approach to understand how these peptides interact with their cell surface receptors to promote cellular responses. Using a comparative biology approach, her research has revealed new insights into insulin-like peptide action. She also takes a similar approach to develop new diabetes treatments based on glucagon-like peptide 1, an incretin hormone that controls insulin secretion and weight gain.

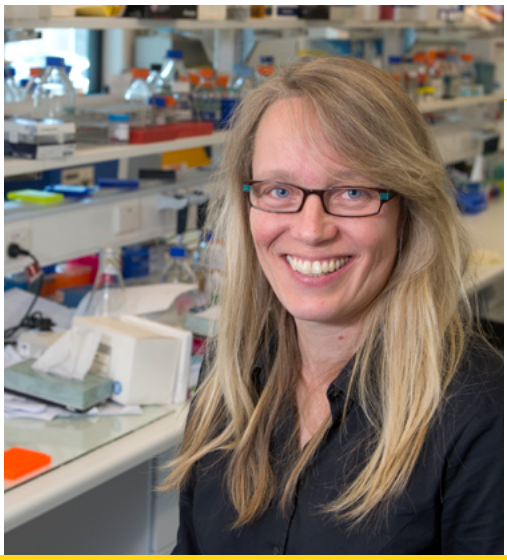
Prof Forbes is also passionate about teaching Biochemistry and promoting Women in Science.

Project currently available

Development of novel treatments for cancer through understanding the basic mechanism by which insulin-like growth factors (IGFs) and insulin bind and activate their receptors (the IGF-1R and the insulin receptor) to promote cell growth, survival and metabolic control.

Background required for the project

A knowledge of cell biology, signalling and protein structure and function would be desirable.



> *In shedding light on the mechanisms behind environmental and TOR pathway control of cell division we will aim to target these in human cancers.*

Environmental Control of Cell Growth and Cell Division

Researcher A/Prof Janni Petersen

Email Janni.Petersen@flinders.edu.au

Research area and interests

Target Of Rapamycin TOR and AMPK signalling networks are the major nutrient sensing pathways in all eukaryotic cells. Our work aims to extend our understanding of two major signalling networks that are implicated in tumourigenesis and diabetes in humans to adjust growth and cellular metabolism in response to changes in the nutrient environment. Our main model organisms are *S. pombe* and mammalian tissue culture models.

Biography

After completing a Research Associate position with Nobel Laureate Sir Paul Nurse at the Rockefeller University in New York USA, I became a Lecturer within the Faculty of Life Sciences at The University of Manchester, UK in 2005. In December 2009, I was awarded a 6 years Cancer Research UK Senior Research Fellowship. My appointment to Flinders University as an Associate Professor along with a Faculty appointment at SAHMRI (South Australian Health and Medical Research Institute) as part of the Nutrition and Metabolism theme commenced 2015.

My group is well funded by the Australian Research Council (ARC), the National Health and Medical Research Council (NHMRC) and Worldwide Cancer Research.

Key references

Davie, E , Forte G, and Petersen, J. Nitrogen regulates AMPK to control TORC1 signaling. Current Biology. 2015 16:445-454

Davie, E and Petersen, J. Environmental control of cell size at division. Current Opinion in Cell Biology. 2012 24:838–844

Petersen, J. and Nurse, P. TOR signalling regulates mitotic commitment through the stress MAP kinase pathway and the Polo and Cdc2 kinases. Nature Cell Biol. 9: 1263 – 1272. 2007

Background required for the project

Medical Science, Biotechnology, Genetics, Biochemistry, Cell biology

Project currently available

Cancer is a disease of inappropriate cell growth and cell division. In addition, cancer cells migrate to colonise new parts of the body, here they undergo cell division in environments with limited nutrient supply and therefore cancer cells are frequently nutritionally stressed. The Target of Rapamycin (TOR) signalling pathway co-ordinates cell division with available nutrients and importantly altered TOR signalling has been linked to 80% of cancers.

In shedding light on the mechanisms behind environmental and TOR pathway control of cell division we will aim to target these in human cancers.

The student will gain experience with a range of techniques including mammalian tissue cultures, cell biology and genetics, Biochemistry including: SDS-PAGE, western blotting immuno-precipitations, kinase assays. Molecular biology including: PCR, DNA cloning and DNA sequencing. Immuno-fluorescence microscopy and live cell imaging.

Our work in colorectal cancer is currently funded by The World Cancer Research Fund International and Tour de Cure.

FCIC Gene Expression Laboratory

Researcher A/Prof Michael Michael

Email Michael.Michael@flinders.edu.au

Research area and interests

We study the epigenetic determinants of colorectal cancer, including the involvement of non-coding RNAs. Our studies include:

- Understanding environmental (dietary) influences on cancer risk
- Understanding cellular adaptations to altered metabolism
- Developing biomarkers for cancer diagnosis and prognosis
- Exploring novel RNA-based therapeutics

Biography

Our laboratory is located on the 4th floor of the Flinders Centre for Innovation in Cancer Building, with access to advanced imaging and molecular biology equipment, as well as real-time cell analysis facilities.

We are currently funded by The World Cancer Research Fund International and Tour de Cure. In 2019, we consist of PhD students, honours and undergraduate placement students, as well as a very experienced research assistant. We are also lucky to have an Artist in Residence, who shares a fresh perspective on the cancer experience.

Projects currently available

- Study genes that mediate cancer cell responses to histone deacetylase inhibitors.
- Characterise 3-dimensional organoid models of colorectal cancer

With A/Prof Janni Petersen:

- Identify cancer-specific targets for the diabetes drug, metformin
- Identifying drugs that enhance the anti-cancer effect of metformin
- Develop yeast vesicles as a vector for gene therapy

Background required for the projects

B.Sc or B.Med. Sci. with a focus on molecular biology, genetics (especially human genetics) and biochemistry. Some practical experience with molecular biology, or mammalian cell culture would be an advantage.

> *Importantly, our consumer advisory group, comprised of prostate cancer patients, ensures that our research is relevant to patients.*

Prostate Cancer Research Group

Researcher A/Prof Luke Selth

Email Luke.Selth@flinders.edu.au

Research area and interests

Prostate cancer will affect approximately 1:7 Australian men and results in >3,000 deaths per annum in this country alone. To improve outcomes for men with this disease, the Prostate Cancer Research Group at Flinders University undertakes basic research to characterise the mechanisms by which prostate tumours metastasise and become resistant to targeted therapies. We feed this new knowledge into translational research projects aimed at developing new drugs and biomarkers to improve the treatment and management of patients.

Our research exploits a unique assortment of model systems (patient-derived xenografts, patient-derived tumour material cultured in the lab, and cell lines), contemporary 'omic' techniques and cutting-edge bioinformatics tools. Our research is facilitated by outstanding international and national collaborations with other scientists and clinicians as well as experts in other disciplines (e.g. engineers, mathematicians). Importantly, the Selth lab also has a "consumer advisory group" comprised of prostate cancer patients who ensure that our research is relevant to patients.

Biography

After completing my PhD in Adelaide in 2005, I undertook post-doctoral studies at Cancer Research UK's London Research Institute, funded by a prestigious EMBO long-term post-doctoral fellowship. There, I developed expertise in cancer biology and a skill-set in advanced molecular biology, biochemistry and bioinformatics.

Returning to Adelaide in 2009, I won multiple fellowships (including a Prostate Cancer Foundation Young Investigator Award) to establish my research program in prostate cancer. My new lab in Flinders Centre for Innovation in Cancer is funded by grants from the National Health and Medical Research Council (NHMRC), Movember and Cancer Australia.

I have received multiple awards for my research, including the Millennium Award (Lorne Genome Conference, 2011) and the Rob Sutherland Award (7th PacRim Breast and Prostate Cancer meeting, 2019). Moreover, my students have also received many awards, with most going on to post-doctoral studies in excellent labs around the world.

Key references

Das R...Selth LA. (2016). MicroRNA-194 promotes prostate cancer metastasis by inhibiting SOCS2. Cancer Research. 77:1021-1034.

Miao L...Selth LA, Raj GV. (2017). Disruption of androgen receptor signaling induces Snail-mediated epithelial-mesenchymal plasticity of prostate cancer. Cancer Research. 77:3101-3112.

Paltoglou S...Selth LA. (2017). Novel androgen receptor co-regulator GRHL2 exerts both oncogenic and anti-metastatic functions in prostate cancer. Cancer Research. 77:3417-3430.

Lawrence MG*, Selth LA*...Taylor RA*, Risbridger GP*. (2018). Patient-derived models of abiraterone and enzalutamide-resistant prostate cancer reveal sensitivity to ribosome-directed therapy. European Urology. 74:562-572.

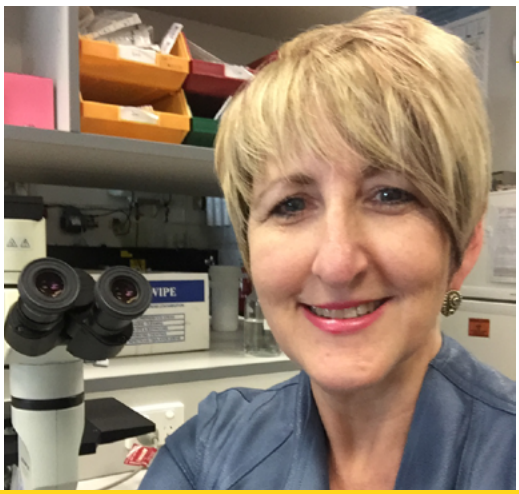
Projects currently available

- Development of novel therapeutic strategies to target the androgen receptor and cyclin-dependent kinases in lethal prostate cancer.
- Cancer cell plasticity as a therapy resistance mechanism in lethal prostate cancer.
- MicroRNAs as mediators and markers of prostate cancer metastasis.
- Non-coding genomic alterations as drivers of lethal prostate cancer (note that this project is primarily bioinformatics-based research).

Background required for the projects

Our lab is always on the lookout for students who are passionate about making a difference to cancer patients. We are particularly interested in those with diverse skills and knowledge, including in the fields of biochemistry and molecular biology, health and medical sciences, biotechnology and bioinformatics. Most of our projects are primarily comprised of "wet lab" research, but students interested in undertaking "dry lab" (i.e. bioinformatics) research are also encouraged to contact A/Prof Selth.

*Equal contributions.



The dream of a cancer treatment that does not require chemotherapy is becoming a reality for some patients with the advent of molecularly targeted therapies.

Lymphoproliferative Research Group

Researcher A/Prof Bryone Kuss

Email Bryone.Kuss@flinders.edu.au

Research group members

A/Prof Bryone Kuss, A/Prof Karen Lower, Dr Lauren Thurgood, Dr Craig Wallington-Beddoe, Dr Stephen Gregory, Dr Binoy Appukuttan.

Research area and interests

Haematological malignancies: Chronic Lymphocytic Leukaemia (CLL) and Multiple Myeloma. Particular interest in metabolomics, proteomics and molecular genomics of these tumours and their response to therapies.

Biography

A/Prof Bryone Kuss is head of the discipline of Molecular Medicine and Genetics at Flinders University, and Director of Clinical and Laboratory Haematology at Flinders Medical Centre. She is the lead clinician for CLL in South Australia and a founding member and co-director of the national body: CLLARC (Chronic Lymphocytic Leukaemia Australian Research Consortium). A/Prof Kuss has a PhD in Molecular Haematology and is a founding fellow of the Faculty of Science, Royal College of Pathologists of Australasia. She is a past recipient of 3 research fellowships: CR Blackburn Research Fellowship (RACP), Howard Florey Centenary Fellowship (Royal Society of London and NHMRC) and the Peter Nelson Leukaemia Fellowship.

Bryone has 5 recent PhD student completions, 2 current students and a skilled research team at Flinders University.

Projects currently available

- Drug resistance mechanisms in lymphoproliferative malignancies
- Lipid metabolism in CLL
- Redox and metabolic changes in CLL

Background required for the projects

Some bench capabilities and background or strong interest in Molecular Genetics, Biology, Cancer.

About the projects

The dream of a cancer treatment that does not require chemotherapy is becoming a reality for some patients with the advent of molecularly targeted therapies. However, in others these new drugs fail as their cancers develop resistance. Understanding how cancer cells do this is the primary aim of our research. Using leukaemic cells from patients with Chronic Lymphocytic Leukaemia (CLL) and Mantle cell lymphoma (MCL), treated with Ibrutinib and/or Venetoclax, we will explore the molecular mechanisms of drug resistance and find new ways to overcome it.

Ibrutinib, an inhibitor of Bruton's tyrosine kinase which impairs the B cell receptor (BCR) pathway in lymphocytes, and venetoclax, which inhibits the prosurvival protein BCL2, are two such molecular therapies. We hypothesise that resistance mechanisms will be multifactorial involving functional escape from the BCR pathway inhibition by utilisation of pathway redundancy; alteration of homing receptor expression; metabolic rewiring and reactivation of the NFkB and NFAT pathways.

This research project addresses these clinical issues using a comprehensive and systematic approach to explore resistance mechanisms and molecular escape. This work represents collaboration between Flinders Medical Centre, Peter MacCallum Cancer Centre and Royal North Shore Hospital.

I am currently working towards establishling a Metabolomics facility with Dr Tim Chataway (Flinders Proteomic Facility) at Flinders University.

Lymphoproliferative Research Group

Researcher Dr Lauren Thurgood (A/Prof Bryone Kuss lab)

Email Lauren.Thurgood@flinders.edu.au

Research area and interests

Proteomics, Haematological malignancies (CLL, multiple myeloma), Cancer cell metabolism

Biography

I am an early career researcher who holds a 3-year fellowship from the Cancer Council SA. I also have multiple small grants for small projects. Our lab is a large team with PhD students, Honours students, medical students and support from many academic staff members with experience in genetics and biochemistry. I work closely with the Flinders Proteomic Facility and am currently working with Dr Chataway (Head of Proteomics) to establish a Metabolomics facility at Flinders University.

I have over 20 publications in peer reviewed journals, frequently give presentations at conferences and am a member of numerous committees including the College of Medicine and Public Health Honours Committee and the recently formed Gender Inclusion Diversity and Equity (GIDE) committee.

I am a passionate science communicator and have been involved in Pint of Science as well as the Adelaide Proteomics Group. I am a member of the American Society for Haematology, International Society of Experimental Haematology, Australasian Proteomics Society and the Haematology Society of Australia and New Zealand.

Projects currently available

Multiple projects that encompass proteomic analysis in CLL and myeloma. These include protein markers of drug responses, biomarker discovery, predicting disease course etc. Projects will utilise patient samples as well as cell lines representative of the disease.

I also have an interest in cancer cell metabolism and how cancer cells use nutrients to proliferate. This includes investigating metabolic targets for new therapies.

Backround required for the project

Professional Placement topics, Biochemistry.

> *Being a cancer scientist and clinical haematologist, I seek to translate research findings to the clinic, focusing on novel biomarkers and therapeutic strategies for multiple myeloma.*

Multiple Myeloma Translational Research Laboratory

Researcher Dr Craig Wallington-Beddoe

Email Craig.Wallington-Beddoe@flinders.edu.au

Research area and interests

My translational research program focuses on the presently incurable blood cancer multiple myeloma with the aim of investigating key biological processes to develop novel therapeutic strategies. The research is conducted at Flinders University and at the Centre for Cancer Biology UniSA, and links with the haematology clinical trials unit and direct patient management at Flinders Medical Centre.

Biography

Dr Wallington-Beddoe is a Consultant Clinical Haematologist at Flinders Medical Centre, Senior Lecturer at Flinders University and NHMRC Research Fellow at the Centre for Cancer Biology, University of South Australia. He is Director of Haematology Clinical Trials for Southern Adelaide Local Health Network where he is the Principal Investigator for several clinical trials for patients with the aggressive blood cancer multiple myeloma. Being a cancer scientist and clinical haematologist, Dr Wallington-Beddoe seeks to translate research findings to the clinic, focusing on novel biomarkers and therapeutic strategies for multiple myeloma.

After completing specialist medical qualifications in the discipline of haematology at Westmead Hospital in Sydney, Dr Wallington-Beddoe undertook PhD studies at The University of Sydney. His work sought to investigate novel therapeutic strategies for acute lymphoblastic leukaemia and resulted in several high impact publications and numerous national and international conference presentations. In recognition of this work, Dr Wallington-Beddoe was awarded the 2012 Haematology Society of Australia and New Zealand Albert Baikie Memorial Medal and New Investigator Grant. He relocated to Adelaide in 2013 to undertake post-doctoral research, investigating how certain sphingolipid enzymes can be targeted in multiple myeloma to enhance current therapies, and was shortly thereafter awarded an NHMRC Peter Doherty Post-Doctoral Research Fellowship.

Dr Wallington-Beddoe now heads the Flinders University division of an integrated translational multiple myeloma research program in tandem with the Centre for Cancer Biology, UniSA, which aims to maximise clinical and research outcomes for this blood cancer.

Current research group

- 1 Honours student
- 1 PhD student
- 1 Research Assistant

Current funding

- Viertel Foundation Clinical Investigator Award (2019)
- NHMRC Project Grant (2019 - 2021)

Projects currently available

- Manipulating endoplasmic reticulum stress levels in multiple myeloma cells to enhance the cytotoxic effects of proteasome inhibitors and other novel agents, particularly in the setting of relapsed or refractory disease.
- Biomarker and therapeutic roles of adhesion proteins in multiple myeloma.
- Characterising drug efflux transporters on multiple myeloma cells to enhance therapeutic responses.

Background required for the projects

Applied science in biology or biotechnology, medical science, medicine.

> *Our current work is aimed at finding metabolic interventions that can leverage this difference between cancer and normal cells.*

Chromosomal Instability and Cancer Laboratory

Researcher Dr Stephen Gregory

Email Stephen.Gregory@flinders.edu.au

Research area and interests

My research is focussed on finding new ways to target cancers cells. Specifically, we know that late stage cancers typically gain and lose DNA with each cell division and this chromosome instability has characteristic effects on the cell's metabolism that are not seen in normal dividing cells. Our current work is aimed at finding metabolic interventions that can leverage this difference between cancer and normal cells.

Biography

I moved to Flinders University from the University of Adelaide in 2018 to take up a Lectureship. I teach Genetics and Biochemistry to Medical students and the 3rd year Bachelor of Medical Science class. I have been leading my own research lab for 10 years, receiving over $1.5 million in funding from the NHMRC and I have published about 30 papers. I collaborate with researchers at Adelaide Uni and UniSA and am part of a larger consortium looking for better treatments for Chronic Lymphocytic Leukemia. I have supervised 5 PhDs to completion as well as many Honours projects. At the moment I am supervising one PhD student, so I am looking for more keen graduates to join the team.

Projects currently available

- To test our hypothesis that more genetically disrupted cancer cells will produce more reactive oxygen species (ROS), and that this will be a useful prognostic marker for stratifying patient treatments. We will use several methods including Raman spectroscopy to test leukemia samples for the connection between ROS and karyotype.
- To test our hypothesis that there is a novel aneuploidy sensing pathway that connects gain or loss of chromosomes with metabolic disruption. We have identified several genes that seem to mediate this effect and are now in the process of investigating how they work.

Background required for the projects

No specific background is required, but the more molecular biology and genetics you have studied, the easier it will be.

Our research focuses on evaluation and evidence development for precision medicine approaches to inform the use of cancer medicines.

Precision Medicine Group

Researcher Prof Michael Sorich

Email Michael.Sorich@flinders.edu.au

Research area and interests

Identification of patient and tumour characteristics that predict prognosis, treatment benefit and treatment adverse effects for patients with advanced cancers. We aim to provide personalised information to patients on their likely benefits and potential side-effects from cancer treatments in order to assist patients with difficult treatment decision making – the best medicine to choose and the most appropriate dose for the individual. Our primary approach for achieving this involves analysis of large amounts of data collected in clinical trials and as part of routine clinical care of patients with advanced cancer.

Biography

I am a clinical epidemiologist and pharmacist with a primary research interest in the use of biological, chemical, and clinical markers to guide decisions regarding the most appropriate use of medicines (precision medicine). My current research primarily focuses on evaluation and evidence development with respect to precision medicine approaches informing the use of cancer medicines. This includes analysis of pooled clinical trial data, and evaluation of patient data from routine clinical care. Additionally, I research novel biomarkers of drug exposure to better inform drug dosing. Further details regarding my research can be found at www.flinders.edu.au/people/michael.sorich

Examples of relevant research undertaken

- Evaluation of the lung immune prognostic index for prediction of survival and response in patients treated with atezolizumab for non-small cell lung cancer. Journal of Thoracic Oncology. 2019 (doi. org/10.1016/j.jtho.2019.04.006)
- Extended RAS mutations and anti-EGFR monoclonal antibody survival benefit in metastatic colorectal cancer. Annals of Oncology. 2015. (doi: 10.1093/annonc/mdu378)

Projects currently available

We have multiple projects on offer, including analysis of immunotherapies used for lung cancer and a range of other medicines used for treatment of advanced melanoma, colorectal cancer, breast cancer, and thyroid cancer. Some projects utilise data from clinical trials of medicines, and others are based on big data from registries of patients treated as part of routine clinical care.

Background required for the projects

Most projects have a core component of data analysis and, as such, an interest in learning quantitative skills in data analysis is important. No extensive background in data analysis is required, only an interest in data analysis and in developing such skills.

> *The aim is to help clinicians and patients make more informed decisions about their medicines.*

Precision Medicine Group

Researcher Dr Ashley Hopkins

Email Ashley.Hopkins@flinders.edu.au

Research area and interests

Our group uses 'big data-sets' to develop prognostic tools that can present personalised likelihoods of therapeutic and adverse effects to medicines. The aim is to help clinicians and patients make more informed decisions about their medicines.

We currently have access to data (demographic, laboratory and tumour data) from over 60,000 advanced cancer patients treated with immunotherapies, targeted therapies and chemotherapies. Such data allow the development of prognostic tools that can present personalised likelihoods of therapeutic and adverse effects to medicines. It is hypothesised that effective communication of personalised predictions of expected benefits and harms from medicines used in advanced cancer treatment will improve shared decision making, lead to more informed and empowered patients, and enable better decisions regarding whether to commence and continue medicines.

Improved data collection and data sharing initiatives are allowing validated prognostic models to be developed for multiple outcomes for multiple medicines. Therefore, a research focus of the group involves the development of prognostic tools via the analysis of "big data" sourced from clinical trials or from data registries. However, there is very little evidence on the optimal design of prognostic tools or apps for the presentation of both benefit and harms to medicines used in advanced cancers. Therefore, another focus of the research group involves investigating optimal decision aid designs that facilitate effective and relevant communication of personalised predictions of expected benefits and harms from medicines used in advanced cancer treatment, with a patient centred focus.

Biography

I am a National Breast Cancer Foundation (NBCF) of Australia Early Career Fellow working in the Precision Medicine Group. Our group also has funding from NHMRC, Tour De Cure, Cancer Council SA, and Pfizer.

My research focus is precision oncology. I use clinical epidemiology and pharmacometric techniques to develop clinical prediction models for advanced cancer treatments. Ultimately these models aim to improve patient outcomes by identifying precision use strategies and facilitating informed decisions with respect to medicines.

The data with which my clinical prediction models are made are typically "big data", sourced from clinical trials conducted by pharmaceutical companies, or data registries. Current data contributors include Roche, Eli Lilly, Eisai, Novartis, Boehringer Ingelheim, and ASCO's CancerLinQ.

Projects currently available:

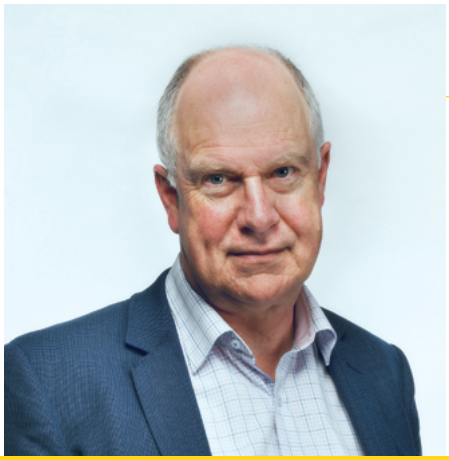
- Analysis of clinical trial and electronic health record data in advanced cancers.
- Facilitating shared decision making in advanced cancers: The importance of effectively communicating risk.

Background required for the projects

Prospective students to the "Analysis of clinical trial and electronic health record data in advanced cancer" project require relevant experience and interest in clinical epidemiology, biostatistics or pharmacometrics, and proficiency with the R programming language or similar. Additionally, students should have an interest in improving cancer care.

Prospective students to the "Facilitating shared decision making in advanced cancers: The importance of effectively communicating risk" project require relevant experience in qualitative research designs (e.g. questionnaire development, focus groups), be clinically orientated and have an interest in improving cancer care.

Applicants to our research group must have a health/pharmacology/biostatistics/pharmacy/medical sciences/nursing/psychology or similarly relevant background, with good verbal and written communication skills.



> *Our research into benign and malignant oesophageal disease integrates laboratory, clinical and population research streams.*

Upper Gastrointestinal (GI) Cancer Research Group

Researcher Prof David Watson

Email David.Watson@flinders.edu.au

Research area and interests

Our aim is to transform the outcomes for individuals with oesophageal adenocarcinoma by prevention and early detection, focussing on strategies to 1) detect precancer or cancer at its earliest stage when cure is more likely; 2) more cost-effectively deliver Barrett's oesophagus (precancer) surveillance by stratifying for cancer risk and targeting individuals at significant risk; and 3) develop a cost-effective framework for Barrett's oesophagus screening in the Australian context.

This is being addressed by:

a) Developing, testing and applying biomarker panels which have potential to detect early cancer and high grade dysplasia in Barrett's oesophagus;

b) Evaluating cancer progression within Barrett's oesophagus surveillance programs to identify individuals at high vs low risk of cancer progression to better target endoscopy surveillance to those at risk, and to remove from surveillance individuals unlikely to develop cancer;

c) Devising and testing new surveillance strategies within a health economics framework to determine cost-effectiveness and cost-utility of new strategies for clinical practice;

d) Working with collaborators in general practice to identify and test opportunities for screening for individuals at high risk of oesophageal adenocarcinoma.

This research entails developing new clinical and genomic data and integrating these outcomes within a health economic model to ensure clinical resources are focussed to areas of greatest benefit, and concurrently to minimise low-value interventions for Barrett's oesophagus and oesophageal adenocarcinoma.

Biography

Prof Watson is a Matthew Flinders Distinguished Professor and Head of Surgery at Flinders University, and an Oesophago-Gastric Surgeon at Flinders Medical Centre. His interests include gastroesophageal reflux, and oesophageal & gastric cancer. He leads clinical and laboratory research addressing benign and malignant oesophageal disease, integrating laboratory, clinical and population research streams. In 2018 he was appointed Clinical Director for the Clinical Trials Network Australia and New Zealand, to enhance surgical research capacity by supporting trainee led multicentre clinical trials.

Prof Watson has published more than 400 papers and book chapters, led the development of Australian national guidelines for the management of oesophageal and gastric cancer, and contributed to national guidelines for the management of Barrett's oesophagus. He is President-elect of the International Society for Diseases of the Esophagus and Board member for Cancer Council SA.

Prof Watson's research group includes 3 other surgical academics, 5 post-doctoral scientists (with expertise in molecular biology, health economics and biostatistics) and 3 research assistants. He has received more than $25M in research grants, with current funding supporting research addressing novel blood tests for cancer, health economic modelling and statistics.

Projects currently available

- Blood biomarkers (eg miRNA, DNA methylation) for diagnosis and treatment prediction
- Breath biomarkers for diagnosis and treatment prediction
- Clinical outcomes and strategies to improve these outcomes
- Health Economic modelling to identify strategies to improve cost-effectiveness of intervention strategies
- Patient preferences for treatments and interventions

Background required for the projects

Molecular biology projects - medical sciences or medicine and broad molecular biology and cell biology laboratory skills.

Clinical and health economics projects – medicine and some clinical exposure to Surgery or GI medicine, but no prior experience with laboratory research.

I am an upper GI surgeon with research interests in upper GI cancer and reflux disease.

Surgery: Oesophago Gastric Unit

Researcher A/Prof Sarah Thompson
(in collaboration with Prof David Watson)

Email Sarah.Thompson@sa.gov.au

Research area and interests

Clinical projects involving oesophageal cancer, gastric cancer and GIST.

Biography

A/Prof Sarah Thompson is an upper GI surgeon with research interests in upper GI cancer and reflux disease. She holds a PhD in oesophageal cancer and has published more than 90 peer-reviewed papers. A/Prof Thompson works closely with Prof David Watson, Dr Tim Bright, Dr Jon Shenfine, and Dr Jacob Chisholm.

Project currently available

Project involves mature oesophageal/gastric cancer prospective database including >680 oesophagectomies, and >280 gastrectomies.

Background required for the project

Prefer medical degree (MBBS or MD) and some clinical experience.

> *Breath analytics represents an exciting, cutting edge technology that will provide new capabilities in the detection and monitoring of disease.*

South Australian Breath Analysis Research Laboratory

Researcher Dr Roger Yazbek

Email Roger.Yazbek@flinders.edu.au

Research area and interests

My research team is focussed on developing and validating new breath analysis tools that will offer new opportunities for early detection of disease and improved clinical management. We collaborate with local and international experts, creating a valuable transdisciplinary network that will facilitate translational outcomes.

Breath analytics represents an exciting, cutting edge technology that will provide new capabilities in the detection and monitoring of disease. Breath analytics already have wide-spread clinical use for detection of Helicobacter Pylori, measurement of gastric emptying, assessment of sugar intolerance, and more recently, prediction of heart transplant rejection.

Biography

I received my PhD from Flinders University in 2009, where I described a role for dipeptidyl peptidases in inflammatory bowel disease. In 2011, I received a highly competitive NHMRC Early Career Research fellowship to continue my research into dipeptidyl peptidases and gastrointestinal disease.

I moved to Flinders University in 2015 as the Catherine Marie Enright Kelly research fellow and established the South Australian Breath Analysis Research laboratory, overseeing an innovative research program to develop new breath analysis tools for the non-invasive detection of cancer, infectious disease and gastrointestinal dysfunction. I lead a dynamic team of researchers who are passionate about improving cancer detection using non-invasive technologies such as breath testing. I have forged a reputation as an internationally recognised researcher as evidenced by my current work with the International Atomic Energy Agency to develop and validate new stable isotope tests for gastrointestinal damage in children. My recent publications describe two, exciting new breath tests that will have direct translational impact for children with gastrointestinal dysfunction. I am passionate about improving the interface between science and the community and building a pipeline of professionals to secure the future of the industry, and was recognised by a 2013 Tall Poppy Award. I am a Director with the ASMR board since 2009 and serving my third term as President of the society.

Project currently available

Using stable isotope labelled energy substrates, you will investigate cancer cell metabolism in oesophageal cancer cell lines (using 'cell breath test' techniques). Our preliminary data suggests that different cancer cell lines have distinct metabolic patterns that can be measured by stables isotope labelled compounds. The aim of the project will be to characterise how these labelled compounds are utilised by the cells, and define potential mechanism using specific inhibitors of metabolic pathways. This work will lay the foundations to develop a breath test for oesophageal cancer.

Background required for the project

Biochemistry, Physiology

In 2019 she received funding from NHMRC as well as Cancer Australia to further her research into bowel cancer prevention.

Bowel Health Service

Researcher A/Prof Erin Symonds

Email Erin.Symonds@flinders.edu.au

Research area and interests

The research of the Bowel Health Service focuses on preventing bowel cancer. This includes developing new biomarkers to improve screening options for people in the community, personalising surveillance for people at increased risk for bowel cancer, and monitoring for risk of cancer recurrence after surgery.

Biography

A/Prof Erin Symonds is Senior Research Scientist with 20 years of experience in gastroenterology research. Since the beginning of 2013 she has been managing the research at Bowel Health Services in the Flinders Centre for Innovation in Cancer. Her team includes research nurses, technical and administration assistants, and other students. In 2019 she received funding from NHMRC as well as Cancer Australia to further her research into bowel cancer prevention.

Projects currently available

Developing biomarkers to prevent bowel cancer. This study will involve lab work and will assess methylation levels of DNA in bowel cancers and in pre-cancerous lesions.

- Determining how often colonoscopy should be done to prevent bowel cancer. This study will look into data that has been collected as part of a large bowel cancer surveillance program and will determine what the risk factors for cancer are.

Throughout my career, I have loved the challenges and opportunities of Molecular & Cellular Biology.

Circular RNAs in Cancer Laboratory

Researcher A/Prof Simon Conn

Email Simon.Conn@flinders.edu.au

Research area and interests

Throughout my career, I have loved the challenges and opportunities of Molecular & Cellular Biology. Despite DNA sequencing identifying 26,000 genes, next-generation sequencing of the RNA transcripts has shown, unequivocally, that the canonical RNAs from these genes are the exception, rather than the rule. We investigate the most contemporary class of non-coding RNA transcripts in eukaryotes, called circular RNAs, and how they are formed and regulated in cancer and across stem cell differentiation. These are my molecular heroes and once you start researching them, I guarantee you will not be able to stop.

Biography

I completed my Bachelor of Biotechnology (Hons) at Flinders University, in 2006. My PhD and first postdoctoral position involved profiling single cell-specific transcriptomics and ionomics of live plant cells towards illuminating plant salinity tolerance and nutrient acquisition. Since then, I have worked on mammalian cell biology, in my postdoctoral positions at the European Molecular Biology Laboratory (FRANCE) and the Centre for Cancer Biology (AUSTRALIA).

I continue to research how circular RNAs impact cellular development (Australian Research Council Future Fellowship) and cancer (NHMRC-project funding) in my current position as an Associate Professor, Circular RNAs in Cancer laboratory at the Flinders Centre for Innovation in Cancer, Flinders University. My laboratory currently comprises 3 postdoctoral researchers, 1 animal technician and 1 PhD student.

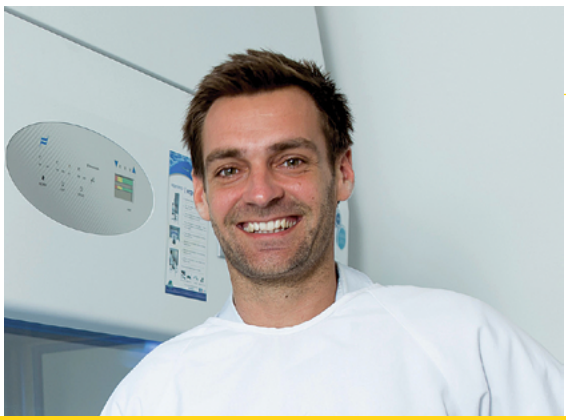
As a team, we have published seminal papers on circRNAs and other molecular biology-rich projects in the top journals in the field, including Cell, Nature Biotechnology, Nature Plants, Nature Communications and EMBO Journal (21 publications in the past 5 years). These articles have been cited over 3,000 citations times and I have been awarded over $2.5M in peer-reviewed research grants in the past 3 years.

Projects currently available

- Circular RNAs as epigenetic writers
- Circular RNAs in stem cell differentiation
- Circular RNAs in cancer

Background required for the projects

Strong molecular biology skills are a must.



> *Starting with patient's cells, we generate live human brain tissue that we can study extensively in the laboratory settings.*

Laboratory for Human Neurophysiology and Genetics

Researcher Dr Cedric Bardy

Email Cedric.Bardy@sahmri.com

Research area and interests

Research area: Neuroscience
Specific interests: Brain Cancer, Human genomics, Neurobiology, Stem cells, Biotechnologies, Patient-derived cell models, Bioinformatics, Electrophysiology, Neurological disorders.

Neurological disorders have an immense burden on our society. However, the majority of pharmacological discoveries do not succeed in human clinical trials. To resolve this issue, our team is developing cutting-edge technologies to better recreate conditions of the human brain in vitro. Starting with patient's cells, we generate live human brain tissue that we can study extensively in the laboratory settings.

Biography

The Bardy lab is based at SAHMRI and our team currently comprises Dr Bardy, 2 postdocs, 4 PhD students, 1 research assistant and 1 honour student. We love a good challenge and enjoy working in a dynamic and collaborative environment.

Selected relevant publications

- Neuronal medium that supports basic synaptic functions and activity of human neurons in vitro. Bardy C et al. PNAS (2015)
- Probing sporadic and familial Alzheimer's disease using induced pluripotent stem cells Israel MA et al. Nature (2012)
- A human neurodevelopmental model for Williams syndrome Chailangkarn T et al. Nature (2016)
- Evaluating cell reprogramming differentiation and conversion technologies in neuroscience Mertens J et al. Nature Reviews Neuroscience (2016)
- Single-cell multimodal transcriptomics to study neuronal diversity in human stem cell-derived brain tissue and organoid models. Hurk MVD and Bardy C. Journal of Neuroscience Methods (2019) 325:108350
- Predicting the functional states of human neurons with single-cell RNA-seq and electrophysiology Bardy C et al. Molecular Psychiatry (2016)
- Efficient Generation of CA3 Neurons from Human Pluripotent Stem Cells Enables Modeling of Hippocampal Connectivity In Vitro. Sarkar A et al. Cell Stem Cell (2018) 22: 684–697.e9

Project currently available

Investigations of patient-derived live brain tissue will radically transform the neurological field within the next decade and are at the core of all the projects in the lab.

The specific project can be adapted based on the skills of the student and time of recruitment; however, it will fall within one of the three main objectives in the lab:

1. Improving in vitro conditions to culture functional human brain tissue
2. Discovering better treatments for Brain Cancer
3. Discovering better treatments for Parkinson's disease

The brain cancer project will focus on biomimicking the human brain microenvironment in vitro to study cancer progression and identify new potential therapies.

For more details, please email CV and current transcripts to cedric.bardy@flinders.edu.au. See also www.bardylab.com

Background required for the project

Students with a background in neuroscience, genetics, bioinformatics, computer science, biochemistry and/or cell biology will be preferred but everyone is welcome to apply.

Appropriate training will be provided and the students will be able to learn lab skills including tissue culture, genomics, bioinformatics, imaging, and electrophysiology.

Our group is multi-disciplinary and is equally divided between bioinformatics and experimental biology. We investigate the complex interplay between the microbiome, immune system and cancer.

Lynn EMBL Australia Group, SAHMRI Precision Medicine Theme

Researcher Prof David Lynn

Email David.Lynn@sahmri.com

Research area and interests

The Lynn EMBL Australia group is a multi-disciplinary group that is equally divided between bioinformatics and experimental biology. On the wet-lab side the group employs in vitro and in vivo experimental and clinical models coupled with systems biology approaches to investigate the complex interplay between the microbiome, the immune system, and cancer. On the bioinformatics side, the group leads the development of InnateDB.com, an internationally recognised systems biology platform for innate immunity networks (10,000 users worldwide) and a range of other computational biology software and resources. David also leads the computational biology aspects of €12 million European Commission funded project called PRIMES, which is investigating how to model and subsequently therapeutically target protein interaction networks in cancer. The group is currently funded by EMBL Australia; NHMRC and Cancer Australia.

Biography

Prof Lynn is Director, SAHMRI Computational & Systems Biology Program; Professor, Flinders University College of Medicine & Public Health; and EMBL Australia Group Leader, SAHMRI Microbiome & Host Health Program. He leads a multidisciplinary group of computational and experimental researchers who apply advanced systems biology and experimental immunology approaches to investigate the immune system and cancer.

He is an internationally recognised leader in his field and has funding worth >$20 million in the last 5 years (direct external funding >$2.6 million) from European Commission; NHMRC; MRFF, Cancer Australia. In 2016 he was funded to work on the role the microbiota plays in modulating the immune system in different contexts and since then, his team has developed advanced capacity in this field including the establishment of the only germ-free facility in SA. In 2018, he published a high-profile paper showing that in mice disruption of the microbiota in early life led to significantly impaired responses to 5 commercial vaccines routinely administered to millions of infants world-wide (Cell Host & Microbe 2018). This has led to a new, NHMRC-funded clinical trial in 200 human infants evidencing his commitment to rapidly translate preclinical findings.

Background required for the projects

We are seeking students with a broad range of skills. Interest and prior experience in immunology/ microbiology/cancer biology/ computational or systems biology would be an asset.

Previous experience in programming is strongly recommended if seeking a purely computational biology/ bioinformatics project, but mixed wet-lab/bioinformatics projects are a possibility for those without programming skills. Experimental immunology projects are also available. Honours and PhD positions in the lab are highly competitive and will be awarded to students with excellent GPAs.

Projects currently available

- Investigating the impact of the microbiome on cancer immunotherapy efficacy and toxicity.
- Vaccine non-specific effects – how do vaccines induce memory responses in the innate immune system?
- Investigating how the microbiota regulates immunity in early life. (Lynn et al., Cell Host & Microbe 2018. Lynn et al., Journal of Leukocyte Biology 2018).
- The AIR clinical study – a study to investigate the influence of the microbiota on vaccine responses in human infants. (A partnership with Women's and Children's Hospital).
- Bioinformatics/Computational Biology – developing new tools and approaches for systems level analyses of innate immunity and cancer. Previous Honour students have first author papers in the leading Computational Biology journals. (Salamon et al., Cell Systems 2018; Goenawan et al., Bioinformatics 2016).

We wish to support students who are interested in repurposing the technologies and approaches developed in our lab towards maximising the ongoing recovery of individuals undergoing treatment through cancer services.

Personal Health Informatics Group

Researcher A/Prof Niranjan Bidargaddi

Email Niranjan.Bidargaddi@flinders.edu.au

Research area and interests

Our research area is digital health with a special interest in the development of m-health, e-health, and intelligent clinical decision-support tools that are aimed at clinicians and patients.

1. Extending smartphone into a clinical tool in order to observe and understand what is happening in peoples every-day life beyond clinic, so that health professionals can diagnose the problems accurately and earlier. We have developed the infrastructure to learn how symptoms relate to and vary with smartphone data.
2. Positioning smartphones as personal health assistants that assist individuals in their environment with personalised just-in-time support and, developing intelligent machine learning apps that capitalise the data generated by mobile sensing technology (e.g., smartphones, wearable blood alcohol monitors, physiological monitoring sensors, etc.) to become aware of individuals changing circumstances and initiate the right type or amount of support.
3. Creating intelligent tools that enable health service providers to offer anticipatory care and offer personalised support. We have launched two innovative real time clinical analytics applications to initiate personalised out-of-hospital interventions on a needs basis to individuals with persistent psychotic disorders.

We wish to support students who are interested in repurposing the technologies and approaches developed in our lab towards maximizing the ongoing recovery of individuals undergoing treatment through cancer services.

Biography

Niranjan Bidargaddi leads the multidisciplinary Personal Health Informatics group that is located between SAHMRI and Tonsley. My expertise in health technology is well recognised at both national and international levels. I am an MRFF TRIP Fellow (2018), the research leader of Flinders University in the newly established Digital Health CRC (2019–25), and a Chief Investigator at the ARC Industry Transformation Hub on Digitally Enhanced Living (2017–21).

Notable outcomes for our research so far

- https://au.reachout.com/tools-and-apps: Development of the first mental health app recommendation service globally, which is now integrated into reachout.com, accessed annually by a million visitors (Ref: Bidargaddi N, et al. Efficacy of a web-based guided recommendation service of readily available mental health and wellbeing mobile apps for young people: Randomised Controlled Trial, J Med Informatics Res (2017)
- Bidargaddi N, et al. Telephone-based low intensity therapy after crisis presentations to emergency department is associated with improved outcomes and fewer representations, J Telemedicine & Telecare (2015). Led design and trial of psychotherapy via telehealth, first in Australia, now adopted by SA Health; treats over 1,000 patients every year
- Bidargaddi N, et al. To prompt or not to prompt? A microrandomized trial of time-varying push notifications to increase proximal engagement with a mobile health app, JMIR Mhealth (2018). Devised and led study (n=1,255) of a novel trial design to personalise commercial health apps, the first in the world, in collaboration with Harvard & Michigan Uni; used by two companies.

Project currently available

Cancer aftercare guidelines for oncology professionals recommend paying attention to the early detection and recognition of psychological distress, fatigue, pain, problems with daily activities, lifestyle risks, and also to stimulating self-care within the first year after completing the primary curative cancer treatment. This study will examine the utility of specialized mobile health apps for rehabilitation and recovery monitoring and support after cancer treatment. Students working on this project will first conduct a review of the use of m-health monitoring applications in cancer care. Subsequently they will design a protocol and conduct a pilot to demonstrate the feasibility and acceptability of real time monitoring data in cancer services.

> *More Australians than ever are living longer with—and after—cancer. And those people want not only to live but to live well. Our research is about defining what people need to live well and how we can make that happen.*

Cancer Survivorship Research Group

Researcher Prof Bogda Koczwara

Email Bogda.Koczwara@flinders.edu.au

Research area and interests

Our research aims to improve health outcomes for cancer survivors through examination of burden of disability and unmet needs after cancer diagnosis and development and implementation of new models of care for cancer patients and survivors such as systematic collection of patient reported outcomes (PROs).

We have a particular interest in management of comorbidities and cancer, especially cardiovascular disease and are currently developing a nurse led clinical pathway for care delivery.

We have an interest in novel digital technologies to enable access to care and have developed psychological interventions for cancer patients. We are also focusing on e-health literacy and health disparities in access and uptake of digital technologies in cancer.

Flinders Cancer Research

Public events

Throughout the year, we run a series of public events to inform, engage and involve our community. These events include our Cancer Insights Public Lectures, a national Cancer Survivorship Conference (held every two years in conjunction with the Clinical Oncology Society of Australia), events to promote healthy lifestyles and fundraising events.

Participation in research and clinical trials

Clinical trials are essential—from testing new or improved drug treatments, to exploring new management or care regimes, to finding ways to change community behaviours. They allow us to translate medical science into clinical care, bringing research from the lab and into hospitals. They may also provide patients with early access to new treatments that will not be released to the market for another three to four years.

Consumer advocacy and partnering with researchers

We are keen to have consumer involvement in our cancer research and we are currently building our consumer partnering program.

There are many ways to contribute. You can:

- suggest a topic that you would like covered in our Public Lecture series
- request a speaker for your community group or event
- represent the consumer voice on our committees
- partner with our researchers to have a say in their research projects – help us deliver better research programs, better understand the issues that are relevant, and learn how to communicate our research to the community.

Please visit flinders.edu.au/cancer or email us at **cancer@flinders.edu.au** to get involved or find out more.

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