NHMRC Chronic Kidney Disease Centre of Research Excellence

NHMRC CKD.CRE
Final report 2015-2020

Contents

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In the spirit of respect, the Chronic Kidney Disease Centre of Research Excellence acknowledges the Traditional Custodians of the land on which we live and work. We pay our respect to the Aboriginal and Torres Strait Islander elders past, present and emerging.

Summary

Background

A CRE is an NHMRC funded program to support research which aims to improve health outcomes and promote translation of research into policy and/or practice. Its specified purposes are to

- Support conduct and development of innovative, high quality, collaborative research;
- Provide opportunities to expand and improve collaborations among research teams;
- Promote effective translation of research into health policy and/or practice; and
- Foster and build capacity in the health and medical research workforce.

The NHMRC Chronic Kidney Disease Centre of Research Excellence (CKD.CRE) was funded as a 5 year public health and health services program, starting in late 2015, and in 2019, granted a one-year extension.

The CRE had four key research themes, informed by the earlier work of the CKD.QLD program, namely CKD surveillance, CKD practice Improvement, CKD Biomarker Research and CKD Health Economics.

This report summarises the CRE's achievements through 2020, as follows:

Research Stream 1. CKD Surveillance

This theme supported mapping of pre-dialysis CKD patients in public renal specialty practices in Queensland, and the associations, progression and outcomes of their CKD. More than 9,000 patients were recruited to the CKD.QLD Registry, from eleven major practice sites. A data linkage collaboration with the Queensland Health Statistical Services Branch to access data on all admissions, dialysis starts and deaths of Registry patients to any Queensland public hospital, between May 2011 and June 2018, along with those of two parallel cohorts, gave a whole of trajectory view of patient's use of public health facilities.

The CRE also scoped and funded development of a data abstraction tool for Audit4, a commonly used program in renal speciality practices, and demonstrated its use in describing a metropolitan Sydney practice with over 3,900 unique patients with CKD. This tool is now free to all Australian Audit4 users.

Research Stream 2. Practice Improvement

This theme supported improvement in understanding and management of complex and frail patients with CKD, with particular focus on kidney supportive care, primary health care, nursing models of care, and CKD self-management. Expanded use of telehealth in nephrology was another important component.

Research Stream 3. Biomarker research

A CKD Biobank has been established. It is an intended as a repository of plasma, serum, blood, urine, DNA (isolated from saliva), kidney biopsies, and clinical data from CKD patients and healthy controls. Potential predictors of progression have been studied among routine biomarkers and a panel of novel biomarkers of progression has been defined. These will have legacies beyond the CRE.

Research Stream 4. Health economics and CKD

Individual site reports for the CKD registry patients include analyses of hospitalisations. Special attention has been given to high costs users, impact of acute kidney injury, hospital readmissions, costs in the last year of life, and gaps and opportunities in meeting needs of remote-living Indigenous people with CKD.

Education, training and capacity building

The Centre mentored 16 research higher degree students; directly funded 1, supported 8 who had alternative funding, and 7 who were self-funded. The CRE also assisted 17 clinicians with tailored projects and facilitated future scholarships, in some cases using datasets accumulated over the life of the CRE.

In addition, the Centre either hosted or sponsored 12 events, including two national NHRMC CKD.CRE Colloquia, and three national symposia conducted by St George Hospital, NSW, in Kidney Supportive Care.

Budget and Funding

The NHMRC CKD.CRE was awarded a total of $2,469,981. This allocation was used predominantly to support post-doctoral and research higher degree salaries across the four research themes.

Of the 91% ($2,276,981) allocated for salaries, 73% ($1,662,196) went to support post-doctoral and research higher degree students, and 27% ($614,785) for centre management. 9% ($220,000) was allocated for direct research costs within the Biomarker Research program.

The CRE attracted further project funding in the amount of $1,963,351 with a further $475,000 pending legacy project endorsements. The Centre also supported additional successful grant applications by affiliated institutions, totalling $12,720,858.

Consumer Engagement

The Statement on Consumer and Community Participation in Health and Medical Research Participation was developed by the Consumers Health Forum of Australia Inc. (CHF) and the NHMRC, in recognition of the contribution that consumers can make to research, as well as their right to participate in research.

With the early support of Dr Tim Matthews, Medical Director of Kidney Health Australia (KHA), Mikaela Stafrace, CEO of KHA, and the Manager of Queensland's Kidney Support Network (KSN), delegates from both KHA and KSN accepted consumer engagement roles within the CRE, and were active in bespoke research opportunities in addition to the CRE National Colloquiums in 2015 and 2017.

Peripheral Programs

In addition to the central CRE program, 8 state, national and international peripheral programs have been supported. These include the aCQuiRE (Ckd.Qld fabRy Epidemiology) Study, the Queensland Renal Biopsy Registry (QRBR), Safe Water, iNET.CKD, Tiwi Islands Health Research program, and Chronic Kidney Disease of Unknown origin (CKDu).

Publications and Presentations

The work of the CRE and affiliates was presented at local, state, national and international forums, with 91 published manuscripts, 8 book chapters, 3 published reports, 19 CKD.QLD tailored reports and more than 128 conference presentations.

Website

The University of Queensland hosts the NHMRC CKD.CRE Website: https://cre-ckd.centre.uq.edu.au/

NHMRC CKD.CRE final report (2015 – 2020)

The NHMRC Chronic Kidney Disease Centre of Research Excellence (CKD.CRE) was funded as a five year public health and health services program, commencing in late 2015. In 2019, the CKD.CRE was granted a one-year extension.

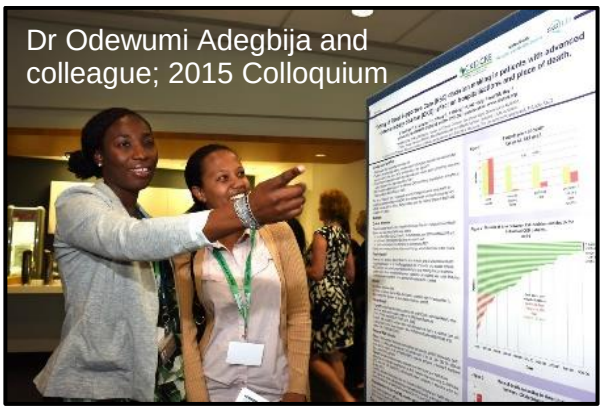
The Centre was constructed to conduct clinical health service research to help determine optimal models of health service delivery for people with CKD; to identify biomarkers for early kidney disease detection; and to support improved patient outcomes. These goals were achieved through four key themes of research activities: 1. CKD Surveillance, 2. Practice Improvement in care of CKD patients, 3. Biomarker Research and 4. Health Economics. These themes were informed by the work of the Chronic Kidney Disease in Queensland Registry (CKD.QLD), an established multidisciplinary research, clinical practice and training collaborative established in 2009.

This report summarises the Centre's capacity building of excellence in research through leadership, multidisciplinary CKD education and training, leveraging its extensive affiliations with collegiate Universities and investigator teams. Impacts were further extended through collaborations in which the Centre provided important support to additional programs in Queensland, nationally and internationally.

The summary below outlines key outcomes and contributions of the Centre.

1. Chronic Kidney Disease (CKD) Surveillance

Theme objectives: to map CKD, its associations, its progression and its outcomes across Queensland, and to promote surveillance of CKD across Australia.


Dr Odewumi Adegbija and colleague; 2015 Colloquium

1.1 Chronic Kidney Disease in Queensland (CKD.QLD)

CKD is a global public health problem. Until recently, most information was extrapolated from registries of patients with end-stage kidney failure (ESKF) who receive kidney replacement therapy (KRT). The richness of similar information on the health trajectory of patients with pre-terminal CKD was missing, although the only opportunity to modify the progression of CKD to ESKF lies with them.

In Australia, we responded by developing CKD.QLD, the Chronic Kidney Disease in Queensland program. Its core platform is a Registry for pre-dialysis CKD patients receiving care in the adult public health system in Queensland. Recruitment started in May 2011 and closed in 2020, with over 9,000 patients enrolled. For investigator and site details, please see Appendix D.

Sixteen reports have been generated for the practice sites that recruited patients to the CKD.QLD registry. Two of those site reports and their attendant patient data were ultimately excluded so that ten sites and 7,800 patients ultimately contribute to registry reports. For details please see Section 9. Each site report has two components. The first, completed for all, is a description of the recruited CKD patients, and incudes their demographics, body habitus, clinical characteristics, comorbidities, primary renal disease, CKD stage, progression and ultimate fate (death or commencement of KRT). The second component is data linkage with other clinical data sets, resulting in continuing analysis of hospital admissions between mid-2011 and

mid-2018. These are a unique set of innovative and comprehensive reports on CKD patients not previously available in the public domain.

In addition to these site-specific reports, this stream produced over 20 publications, 19 tailored reports, and over 50 presentations on causes, ethnicities, socioeconomic status, outcomes and resource utilisation of people with CKD from the Registry dataset. Studies in relation to age, kidney disease, comorbidities, anaemia, obesity, acute kidney injury, progression, rates and predictors of kidney replacement therapy (KRT) and death have been reported. The Centre profiled care at end of life with specificity, including kidney supportive care, timing, and place of death. Topic-specific reports have also been produced for corporate e.g. on anaemia (Amgen, 2015; AstraZeneca, 2020) and institutional collaborators e.g. resource utilisation at end of life (Australian Centre for Health Services Innovation (AusHSI) in 2015).

1.2 iNet.CKD.

iNet.CKD is a collaboration of global CKD surveillance systems, under the auspices of the International Society of Nephrology. CKD.QLD is a founding and core group member. We have contributed to three manuscripts in the peer reviewed Q1 literature with this group: one on hypertension and its management in CKD patients, one on CKD progression, one describing the collaboration and its intent, and are working on a fourth on anaemia. The collaboration with iNet.CKD is a legacy and continues beyond the close of the NHMRC CKD.CRE.

1.3 Evaluation of health service utilisation, costs and outcomes of patients with CKD through Queensland Health Data Linkage

The Centre developed a data linkage collaboration with the Queensland Health Statistical Services Branch to access data on all admissions, dialysis starts and deaths of CKD.QLD Registry patients to any Queensland public hospital, between May 2011 and June 2018. This gave a whole of trajectory view of patient's use of public health facilities. Data include admitting ward, length of stay, primary and associated diagnoses, procedures, disposition and costs. Reports were provided for each site to complement patient profiles. Targeted areas in the reports included high cost users and 'frequent flyers', acute kidney injury in the CKD population, how anaemia impacts on admissions, and a focus on interactions with cardiovascular admissions profiled in the Metro North Health (MNHHS).

The collaboration also gave access to these data of de-identified patients not in the CKD.QLD Registry. Two comparator datasets were generated matched 3:1 for age, gender and Health Service to Registry patients. One comparator dataset was people with CKD, ascertained from ICD codes, but not part of the Registry, and the second was people without CKD and not part of the Registry. Access was approved through Public Health Act (PHA) and Research Ethics approvals. A schematic of the project is provided in **figure 1**.

Thus, hospital admissions, dialysis and death data are available over a seven year period for 7,341 patients in the CKD.QLD Registry, for 22,023 demographically matched hospitalised persons with CKD who were not in the Registry, and for 22,023 demographically matched hospitalised persons without a formal CKD diagnosis. This Collaboration and attendant datasets constitute one of Australia's best resources to profile CKD and hospital resource consumption and also to compare it to that of demographically matched hospitalised persons without known CKD.

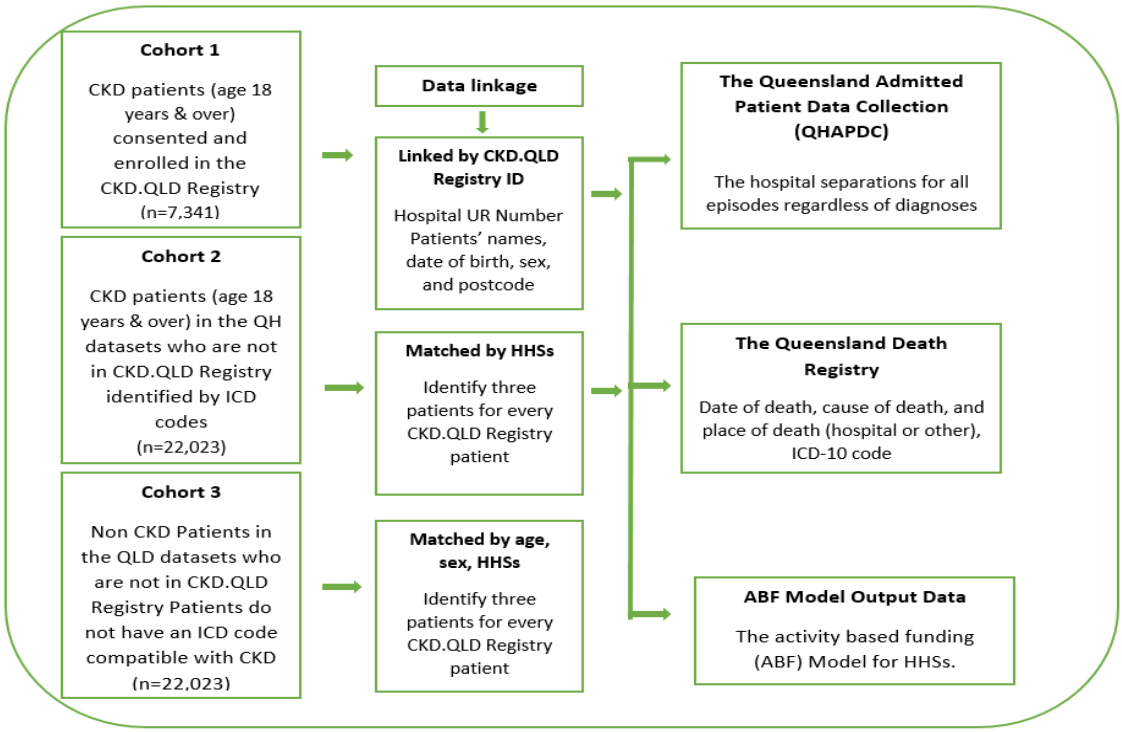


Figure 1: Scheme of data linkage project.

1.4 CKD.QLD Cardiovascular and Renal Endpoints of Diabetic patients Treated in Specialist kidney care (CKD-CREDiTS) study

UQ PhD program. Candidate: Dr Ken-Soon Tan
Advisors: Prof Wendy Hoy (UQ) and Prof Stephen McDonald (University of Adelaide)

The CKD-CREDiTS study examines the characteristics and outcomes of adult patients with CKD and diabetes mellitus receiving kidney specialist care in the public sector in Queensland. Using Registry data and direct clinical chart data extraction, it focuses on mortality, cardiovascular and CKD outcomes. Amongst other strengths, this is the first study to directly compare outcomes of Aboriginal and Torres Strait Islander and Pacific Islander / Maori patients. The project explores four major themes:

1. Baseline characteristics and overall outcomes of patients;
2. Hospital admission data and predictors;
3. Competing risk analysis of kidney failure, death prior to kidney failure, and first major adverse cardiovascular event;
4. Longitudinal trends in eGFR over time.

The study has been completed and final reporting is underway.

1.5 Machine Learning (ML) approaches to prediction of ESKF in CKD.QLD patients

UQ PhD program. Candidate: Dr Marina Wainstain
Advisors: Dr Sally Shrapnel (UQ), Prof Wendy Hoy (UQ) and A/Prof Helen Healy (Queensland Health)

Dr Marina Wainstain, a nephrologist undertaking a PhD with a Royal Brisbane and Women's Hospital (RBWH) scholarship, is piloting the application of ML to predictions in the CKD.QLD data set. In her first project, now completed and submitted for publication, she has compared ML approaches to standard statistical approaches in predicting development of end stage kidney failure in RBWH patients using the 4-factor and 8-factor Tangri equations.

1.6. Machine Learning approaches to Predictions of Readmissions in CKD.QLD data sets.

QUT PhD program. Candidate: Sea Jung Im
Advisors: A/ Professor Yue Xu (QUT) and Dr Jason Watson (QUT)

CKD.QLD Registry data and associated hospital admissions data sets are being explored through Machine Learning approaches to predictions of readmissions among CKD.QLD patients, non-registry CKD demographically matched patients and non-CKD demographically matched controls. This project is being led by a team from QUT, with A/ Professor Yue Xu from the School of Computer Science in the Science and Engineering Faculty, with Research Fellow Dr Jason Watson and PhD student Sea Jung Im. Early results were presented at the 2020 Institute of Electronic and Electrical Engineers (IEEE) Symposium Series on Computational Intelligence (SSCI 2020) and published in the conference proceedings. IEEE is the world's largest technical professional organisation dedicated to advancing technology for the benefit of humanity.

1.7 CKD and Stroke.

QUT RHD program. Candidate: Mr Tain Lloyd
Advisors: (previous) Prof Ann Bonner (QUT), (current) Prof Jane Phillips (QUT), and Prof Wendy Hoy (UQ)

Mr Tain Lloyd, of the Nursing Faculty at QUT, began a project for an MPhil degree in CKD and stroke events in the CKD.QLD Registry cohort. After an interruption, he has resumed with a final report due mid-2021.

1.8 Software4Specialists: Audit4

Audit4 is a comprehensive electronic medical record used throughout Australia and New Zealand in private practice and hospital departments. The CRE scoped and funded development of an Audit4 data abstraction tool, which is now available to all Audit 4 users. As of 2017, more than 20,000 CKD patients were documented in the collective Audit 4 systems. We completed a pilot study using the tool in a large metropolitan Sydney practice with over 3,900 unique CKD patients. We acknowledge Dr David Waugh, Dr Odewumi Adegbija, Ms Dana Segelov and Dr David Hoffman, of S4S Pty Ltd, for their assistance.

1.9 Links to ANZDATA

The Centre began exploration of commonalities and possible linkages with the Australian and New Zealand Dialysis and Transplant Registry (ANZDATA). The intent was to explore feasibility of data linkage of patients in the Registry and those in Audit4 who progress to KRT and registered in ANZDATA. The linkage offers the opportunity to answer important questions on how pre-KRT health profiles influence KRT outcomes.

2. Practice Improvement

Theme objectives: To improve the understanding and management of complex and frail patients with chronic kidney disease, with a particular focus on kidney supportive care, palliative care, primary health care, nursing models of care, and chronic kidney disease self-management

2.1 Primary care

The majority of people with CKD in Australia are under the care of their general practitioner and/or medical service, most never see a nephrologist.

2.1a Primary care referral project

The primary care referral project was an audit of 163 general practitioner referrals to the Kidney Health Service of the Metro North Hospital and Health Service, utilising CKD.QLD Registry data. The project assessed the level of compliance with Kidney Health Australia diagnostic and management guidelines for the referral of patients to a kidney specialty clinic, and was presented at the 2018 Primary Health Care Research Conference.

2.1b Keeping Kidneys Program

The Centre evaluated the implementation of the Keeping Kidneys program at Inala Primary Care and Limestone General Practice (Ipswich). The program accepted referrals from general practitioners (GPs) and selected patients transferred from the Princess Alexandra Hospital chronic kidney disease service. Based on the Beacon Diabetic Clinic model, patients were managed by program GPs with augmented skills in CKD, with nephrologist supervision.

Under this program, eight GPs received training in kidney care together with four practice nurses in advanced level skills. This group of upskilled clinicians provided education at five forums and one national conference on kidney care and the role of general practice in improving management of patients with CKD.

The success of integrated care with general practice demonstrated through Keeping Kidneys has been incorporated into thinking regarding kidney service planning, and informed the establishment of Queensland Health's General Practitioner with Special Interest (GPwSI) initiative.

The Keeping Kidney Service model won a "Kidney Angel Award" from Kidney Health Australia for its impact.

2.2 Complex, frail and/or elderly patients with CKD

Loss of kidney function is part of many people's aging experience, along with the accumulation of other serious health conditions. In this stream, investigators analysed the impact of interactions between CKD and competing determinants of wellbeing, like advanced age and obesity, at person and health system levels.

The work included mapping symptom clusters to identify common co-existing complexes and rate them for frequency, severity, and distress. The response of the system, specifically the resource bundles utilised when the patient attended a healthcare facility, was recorded and evaluated. The effect of innovative and variant models like the kidney supportive care program (KSCp) offered instances of comparison.

Other pieces of work were research in the building of measures of benefits and costs over the longer term. Associated work is understanding what people need to gain competency and autonomy in complex healthcare decision making, and to formulate preferences and expectations as they approach end of life.

2.3 Kidney Supportive Care

The evidence generated by 2.2 informed and supported the establishment and recurrent funding of a Kidney Supportive Care (KSC) program within one Health Service. In 2016, Centre Investigators and associated researchers received a MNHHS Excellence in Research Award for their work in "Improving Management of Chronic Kidney Disease", and in 2017 an ACHS Quality Improvement Awards for Clinical Excellence and Patient Safety.

The expertise and experience Assoc Prof Helen Healy and Prof Ann Bonner developed in the first program was utilised in the Advancing Kidney Care 2026 (AKC2026) *The Queensland Health framework for delivering*

quality care to people with kidney disease (the Framework). They led the working group that produced the KSC pathway, endorsed by Queensland Health in 2019.

The Centre disseminated knowledge and skills in the delivery of care to people at the end of kidney life through its platinum sponsorship of three national symposia organised by Australia's lead clinical agency, the St George Renal Supportive Care Group.

- July 2015: Renal Supportive Care – What's new
- August 2016: Renal Supportive Care – An Evidence Based Symposium
- August 2017: Psycho-social Dimensions of End Stage Kidney Disease

2.4 Telehealth in CKD care 1.

The first initiative in this area was a large multi-site study of internet and mobile phone use by people with CKD, by Prof Ann Bonner and colleagues. The study has been completed and published.

2.5 Telehealth in CKD care 2.

Centre Investigator Assoc Prof Sree Krishna Venuthurupalli (CRE PhD student at the time) and co-investigator Andrea Rolfe, CKD Nurse Practitioner, initiated an access to specialised care for people with CKD living in the Darling Downs region. Starting in 2011, they initiated telehealth specialist kidney consultations that now service ~25% of the >1,000 people in their Health Service, the majority with a family member or carer in attendance. Centre evaluation of the initiative reported estimated savings of 200,000 km in travel and $34,000 in transport subsidies, for first visits alone. Patient satisfaction was formally evaluated in 2015 and rated very high. Other major regional Health Services adopted telehealth as an extension of this model of care. The advent of COVID19 accelerated uptake of telehealth consultation models in all health jurisdictions from 2020 onwards.

2.6 Nurse Practitioner Led Integrated Chronic Disease Model of Care.

Prof Ann Bonner led a prospective, longitudinal study evaluating a novel integrated model of care for patients with the competing complex comorbidities of CKD, diabetes and heart failure, based in two community health centres. The study has been completed and published.

3. Biomarker Research

Theme objectives: The expertise of CRE investigators and colleagues were consolidated into one of Australia's largest CKD Biomarker groups which piloted the workflow of translating biobank resources into therapies.

The Biomarker Stream submitted two further NHMRC Grant applications, one of which went to interview. The efforts of the team for these applications, led by Prof Zoltan Endre, is greatly appreciated by the CRE Investigator team.

3.1 CKD Biomarker Progression study

Not all people with CKD progress to end stage kidney failure. The clinical capability to identify those who do is one of the priority imperatives in clinical nephrology. Equally, identifying those who do not progress represents an opportunity to avoid low value care and offer reassurance to our patients.

Centre Investigators studied the interactions of reduced kidney functional reserve, biomarkers of inflammation and fibrosis on progression of CKD, generating a panel of mechanistic biomarkers including

endothelial cell function. A pre-clinical investigation was published by investigators from the biomarker stream. These studies demonstrated that altered profiles of functional and damage biomarkers were sensitive indicators of subclinical kidney injury, a priming state for CKD.

The usefulness of kidney biomarkers to predict progression of CKD has not been validated in Australia. The two unsuccessful NHMRC Grant Applications had proposed to use the CKD.QLD cohort to select deep-phenotyped subjects with progressing or stable CKD for over two years to determine the utility of renal reserve and mechanistic kidney damage biomarkers for diagnosis at baseline and for predicting progression.

3.2 CKD.Biobank

Establishment of a CKD biobank was a foundational activity of the biomarker stream of research. The biobank is a valuable repository of quality bio-specimens and de-identified linked high-fidelity clinical data from patients with CKD and matched healthy controls. The repository contains plasma, serum, blood, urine, saliva derived DNA, kidney biopsies and clinical data from specimen donors.

The Biobank received Human Research Ethics Committee (HREC) approval in March 2016 with Site Specific Approvals (SSA) obtained in July/August 2017 for the Logan Hospital (Metro South Hospital Health Service) and Royal Brisbane Women's Hospital (Metro North Hospital Health Service). Governance and operational protocols, including how investigators access the resources of the CKD.Biobank, were established and collection of samples commenced soon thereafter.

The scientific potential of collaborative research which shares CKD patient samples across national and international platforms, and across disciplines (e.g. biobanks for cardiovascular risk, metabesity etc.) is immense. Multiple manuscripts including an overview of the biobank establishment have been published.

3.3 The DROP CKD Study: Distinguishing Risk of Progressive Chronic Kidney Disease

Investigators utilised the resources of the CKD.Biobank in designing a multi-parameter biomarker panel with utility to predict kidney function in the following years among people with CKD. The biomarker panel was generated in blood and urine samples from the CKD.Biobank and stratified according to whether the donor's kidney function i.e. estimated glomerular filtration rate, proteinuria, and albumin-to-creatinine ratio, had declined, was stable or improved since recruitment into the Registry.

The experimental design was unbiased and comprehensive, analysing candidate cellular, protein and lipid biomarkers of inflammation, fibrosis, tissue injury and repair, and oxidative stress. Investigators developed a multi-variate statistical model with sophistication to accommodate the high number of parameters. Combinations of parameters with the best accuracy and precision for distinguishing between donors with declining, stable, and improving kidney function and healthy controls were identified and progressed to a refined multi-parameter biomarker panel.

The selected biomarker panel is now ready for testing prospectively, with a view to translation to a clinical tool to aid clinicians predicting a CKD patient's risk of losing kidney function.

3.4 Establishing a human kidney culture model to test plant-derived CKD therapies

A Collaboration of Investigators from the NHMRC CKD.CRE; the School of Biomedical Sciences, UQ; the Conjoint Kidney Research Laboratory, Pathology Queensland; the Kidney Health Service, Royal Brisbane and Women's Hospital; the Kidney Disease Research Collaborative, Princess Alexandra Hospital, University of Queensland and the Institute of Health and Biomedical Innovation (IHBI), Queensland University

Technology, successfully established a reliable human pre-clinical model of oxidative-stress for future assessment of novel bioactive (anti-oxidant) compounds. Oxidative stress is one of the known causes of CKD and molecules targeting this mechanistic pathway that have potential as adjunct therapies to conventional medicines.

The Investigators are using the well-established Adriamycin model of kidney cell injury. This work is in evolution and includes novel finding s of alternate mechanistic states of dysfunction of kidney cells. Publications continue to be generated from this Collaboration.

4. Health Economics and CKD

Theme objectives: To describe and/or inform health resource utilisation by patients with CKD and identify variances in access to these resources.

4.1 Evaluation of health service utilisation, costs and outcomes for hospital admissions of patients with CKD through Queensland Health Data Linkage

The linkage of CKD.QLD Registry data to Queensland Health (QH) data repositories is described in section 1.3. Data in the QH repositories include Queensland Hospitals Admitted Patient Data Collections (QHAPDC); Queensland Death Registry file (downloaded from the Death Registry) and Activity Based Funding Data including Emergency Department presentations at public hospitals and QHAPDC separations.

The first tranche of data, for the period May 2011 to June 2016, contained over 500,000 hospital separations and nearly three million data points of diagnoses and medical procedures. The data were analysed to ascertain the impacts of CKD on medical, health services, financial and physical resources, adjusting for key socio-demographic parameter. Targeted analyses of the high volume/high cost of acute kidney injury in the data set have been published.

The second tranche of data extended the observation period from July 2017 to mid-2018. These analyses are ongoing and have already informed “A Hospital Readmission Prediction with domain knowledge”, a collaboration study with Queensland University of Technology, previously described in section 1.6.

4.2 Socio-economic impacts of CKD

The Health Economics Stream investigators explored how CKD affects labour market participation, personal income and other measures of productivity, achieved socio-economic status, and leisure activities in the Australian population. Two projects using the Australian Bureau of Statistics survey data and involving students and interns seeking research experience were progressed.

4.3 Kidney Supportive Care (KSC)

The Health Economics Stream investigators were members of this research as described in Practice Improvement section 2.3. The outputs to date have included:

(1) The type and cost of health care resources utilised by KSC patients,
(2) The economic evaluation of the implementation of the KSC program, and
(3) The influence KSC has on treatment choices including the decision to discontinue dialysis and choice of place of death.

A manuscript detailing the utilisation of health services by patients enrolled in KSC has been published.

4.4 The LEOPARD study

Centre Investigators Prof Ann Bonner and Dr Balaji Hiremagalur led research of the interactions between symptoms, quality of life, quality-adjusted life years, and costs in 250 patients with CKD from a single centre (Gold Cost Hospital and Health Service) over a 2-year period. Results were presented at Australia's peak kidney medical (ANZSN) and nursing (RSA) scientific meetings and a manuscript is in preparation.

5. Capacity Building and Education

A key purpose of NHMRC Centres of Research Excellence is to foster and build capacity in the health and medical workforce. In addition to the CKD.CRE funded post-doctoral fellows, the Centre has supported a range of science, medical and nursing students undertaking higher degrees and targeted research projects.

The Centre mentored 16 research higher degree students; directly funded 1, supported 8 who had alternative funding, and 7 who were self-funded. Among these, 8 have completed, 1 is in examination, and 7 are on track for successful completion (**Table 1**). The CRE also assisted 17 clinicians with tailored research projects (**Table 2**). The Centre has also facilitated future scholarships, in some cases using datasets accumulated over the life of the CRE.

Table 1. Summary of MPhil and PhD students, funding*, topics and status

Name (Affiliation(s))	Type	Funding	Topic	Status
Dr Leanne Brown (QUT QH)	PhD	Funded	A randomised controlled trial of a decision support intervention to support older individuals with advanced kidney disease.	Completed
Dr Hayfa Al Mutary (QUT)	PhD	Funded	Exploring symptom clusters in people with chronic kidney disease	Completed
Dr Kathryn Havas (QUT)	PhD	Funded	Person-centred care in chronic kidney disease: The CKD-SMS study	Completed
Dr Nguyet Thi Nguyen (QUT)	PhD	Funded	Self-management program for people with chronic kidney disease in Vietnam: A pragmatic randomised controlled trial	Completed
Dr Harith Yapa (QUT)	PhD	Funded	Contributing factors to health-related quality of life in people with chronic kidney disease in Sri Lanka	Completed
Ms Colette Wembenyui (QUT)	MAppSc (Res)	Self-funded	Examining knowledge and self-management of CKD in a primary health care setting: Validation of two instruments	Completed
Dr Sree Krishna Venuthurupalli (UQ QH)	PhD	Self-funded	CKD.QLD: Establishment of Chronic Kidney Disease Surveillance and Research in Queensland, Australia	Completed
Mr Evan Owens (UQ)	PhD	Funded	Clinical Biobanking and the Distinguishing Risk of Progressive Chronic Kidney Disease Study	Completed
Dr Ken-soon Tan (UQ QH)	PhD	Self-funded	CKD.QLD Cardiovascular and Renal Endpoints of Diabetic patients Treated in Specialist kidney care (CKD-CREDiTS) study	Submitting
Ms Haunnah Rheault (QUT)	DHlthSc	Self-funded	Health literacy and chronic disease self-management in Indigenous Australians	In progress
Dr Marina Wainstain (UQ QH)	PhD	Funded	Predictions of deaths and renal failure in CKD populations, a deep learning approach	In progress
Mr Mohamed Ali Kahn - UQ	PhD	Funded	Treating chronic kidney disease with plant extracts of bush pumpkin	In progress
Mr Tain Lloyd - QUT	MPhil	Self-funded	The frequency, costs and burden of stoke in patients with CKD in the CKD.QLD Registry.	In progress
Dr Clyson Mutatiri (UQ QH)	PhD	Self-funded	Referral patterns, disease progression and impact of the Kidney Failure Risk Equation in a CKD.QLD registry cohort	In progress
Dr Vishweswar Chilumkurti (UQ)	PhD	Self-funded	A cost and outcomes analysis of Indigenous patients with CKD in Queensland Health: A Retrospective Study	In progress
Sea Jung Im (QUT)	PhD	Funded	Hospital Readmission Prediction using discriminative patterns	In progress

*Funded Research Higher Degrees (inclusive of NHMRC and other scholarships/university support)

Table 2. Health practitioners with research projects

Name (Affiliation)	Theme / areas of interest (Queensland Hospital and Health Service/Renal Service)
Dr Rajitha Abeysekera (QH)	Heterogeneity in patterns of progression of chronic kidney disease (Metro North)
Dr Samuel Chan (QH)	Body mass index, mortality & progression to ESKF (Metro North, Logan & Darling Downs)
Dr Deepak Darshan (QH)	Incidence and prevalence of cardiovascular disease in patients with CKD (Darling Downs)
Dr Heather Curley (QH)	The burden of cardiac disease in patients with CKD (Darling Downs)
Ms Shirley Champers (QUT)	A feasibility study to track the last 12 months of life in patients with CKD
Ms Andrea Rolfe (QH)	Improving access to specialist renal care: a NP-led CKD telehealth service (Darling Downs)
Ms Anne Graham (QH)	A profile of CKD patients & their outcomes in a Nurse Practitioner model of care (Townsville)
Ms Sidney Niogret (UQ)	Cardiovascular hospitalisation and cost of care in CKD patients (Metro North)
Dr Pooja Sanghi (QH)	Major comorbidities associated with CKD (Darling Downs)
Dr Dev Jegatheesan (QH)	Establishment of the Queensland Renal Biopsy Registry (Multi-site)
Ms Sonya Coleman (QH)	Patients satisfaction with nurse-led CKD clinics, a quality improvement study (Multi-site) Characteristics and outcomes of CKD patients in a community care model (Metro North)
Dr Ibrahim Ismail (QH)	Bariatric procedures in obese patients with CKD (Darling Downs) A study of Registry data of Myeloma related CKD (Darling Downs)
Dr Cassandra Rawlings (QH)	Comparisons of patients with advanced CKD planned for kidney supportive care vs renal replacement therapy; timing of renal supportive care decision making (Metro North)
Dr Usman Mahmood (QH)	Heterogeneity of CKD (Metro North) Profiles of the very elderly with CKD (Metro North)
Dr Greg Wilson (QH)	Acute kidney injury associated with CKD (Logan & Metro North) Associations of cancer and acute tubular necrosis (Logan & Metro North) Prevalence/characteristics of acute interstitial nephritis & pyelonephritis (Logan & Metro North)
Dr Andrew Jeyaruban (QH)	Determining the association of allopurinol in CKD progression (Metro North) Impact of cardiovascular events on mortality and decline of kidney function (Metro North) Determining the association between the type of intervention for ischaemic heart disease and mortality and morbidity in patients with chronic kidney disease (Metro North)
Dr Robert Ellis (UQ)	Optimising assessment of kidney function when managing localised renal masses (systematic review) Factors associated with acutely elevated serum creatinine following radical tumour nephrectomy (CKD-Tuned Study) Outcome measures used to report kidney function measurements investigating surgical management of kidney tumours: a systematic review (Systematic review) Progression of kidney disease in those with single kidneys

Metro North Award: Kidney Supportive Care
(L>R): Dr Carol Douglas, Ms Carla Scuderi, Dr Cassandra Rawlings, A/Prof Helen Healy, Prof Ann Bonner, Dr Marcin Sowa and Ms Danni Heffernan

DDHHS Renal Services team awarded a Queensland Health and Department of Health Excellence award (telenephrology)
(L>R): Dr Vinod Kelgi, Dr Sree Krishna Venuthurupalli, Dr Usman Mahmood, Ms Andrea Rolfe, Mr John Fanning and QH Director General, Michael Walsh.

The Centre hosted multiple events including two national Colloquia and sponsored additional educational occasions. These are listed in **table 3** below, with Colloquia highlights following. Both Colloquia were vehicles for community participation, bringing together policymakers, planners, practitioners, renal consumers, other end-users and the general public to provide an interactive forum where emerging CRE findings were presented, their implications for health policy and practice discussed, and opportunities for effective translation considered.

Table 3. NHMRC CKD.CRE hosted and sponsored events

Number	Host or Sponsor	Event and synopsis	Month Year	Location	Attendance
1	Host. Sponsored by AMGEN	National CKD Surveillance Network Meeting	06/2015	Stamford Plaza Melbourne	22
2	Sponsor	St George Kidney Supportive Care Symposium	07/2015	St George Hospital Auditorium, Sydney, NSW	>100
3	**Host**	**2015 NHMRC CKD.CRE Colloquium***	**07/2015**	**RBWH Education Centre**	**>100**
4	Host	Survival Analysis (time to event analysis) Workshop	01/2016	Centre for Chronic Disease, UQ	12
5	Sponsor	St George Kidney Supportive Care Symposium	07/2016	St George Hospital Auditorium, Sydney, NSW	>100
6	Sponsor	Kidney Supportive Care Master Class	08/2016	RBWH Education Centre	100
7	**Host**	**2017 NHMRC CKD.CRE Colloquium****	**07/2017**	**RBWH Education Centre**	**>100**
8	Sponsor	St George Kidney Supportive Care Symposium	08/2017	St George Hospital Auditorium, Sydney, NSW	>100
9	Sponsor	Kidney Supportive Care Symposium: Key note speaker: Prof Fliss Murtagh	02/2018	RBWH Education Centre	120
10	Sponsored by AMGEN	Prof Agnes Fogo 'Progressive Glomerulosclerosis - The Vicious Cycle)	02/2018	RBWH Education Centre	37
11	Sponsored by Sanofi	Prof Hernan Trimarchi 'CKD, Fabry Nephropathy and Podocyturia'	02/2018	Centre for Chronic Disease, UQ	20
12	Host	Dr Sree Krishna Venuthurupalli 'A personal journey in clinical research'	08/2019	Centre for Chronic Disease, UQ	15

*Chronic Kidney Disease Centre of Research Excellence - Colloquium 2015. RBWH Education Centre

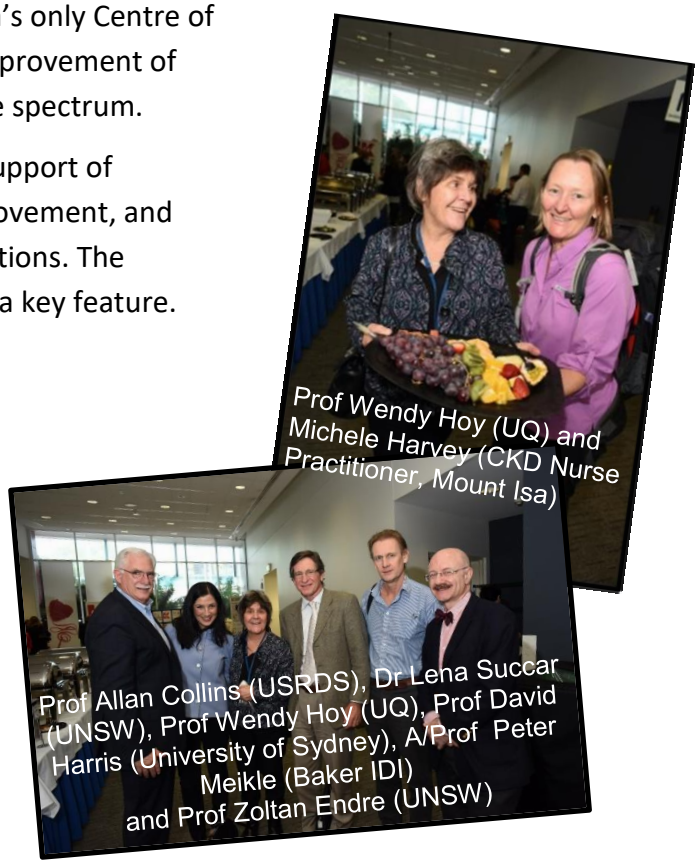
The 2015 Colloquium introduced the Centre as Australia's only Centre of Research Excellence in CKD, and its dedication to the improvement of CKD knowledge and management across the health care spectrum.

The two day program outlined key goals including the support of national CKD surveillance efforts, support practice improvement, and the incorporation of systematic health economic evaluations. The establishment of Australia's first CKD Bio.Bank was also a key feature.

Key note speakers included:

- Ms Lisa McGlynn, Senior Executive Health Group, Australian Institute of Health and Welfare;
- Prof David Harris, University of Sydney;
- Prof Allan Collins, USA Renal Data System;
- Mr Daniel Williamson, Queensland Health Aboriginal and Islander Health Unit; and
- Ms Amber Williamson, Kidney Health Australia.

Over 100 individuals attended both days. A highlight dinner meeting was sponsored by AMGEN Australia.



****2017 NHMRC CKD.CRE Colloquium. RBWH Education Centre**

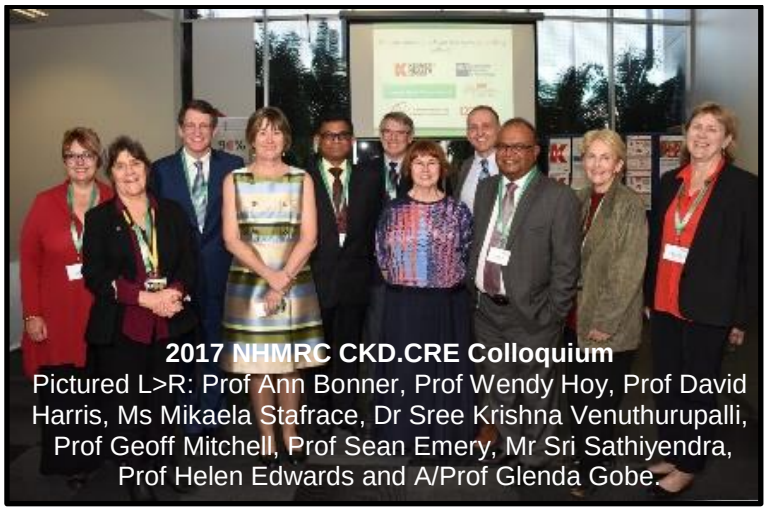
The 2017 Colloquium provided a mid-program overview of the Centre's progress, showcased individual achievements and included an intimate meeting of its Consultation and Engagement Committee. Over 100 people attended.

Key note speakers included:

- Prof David Harris, University of Sydney, provided a global perspective of CKD Surveillance endeavours
- Ms Mikaela Stafrace, CEO Kidney Health Australia who provided an update on Kidney Health Australia's approach to improving outcomes for people with CKD

Presentations included:

- Dr Sree Krishna Venuthurupalli: CKD in the Darling Downs; a Registry report
- Mr Evan Owens: Distinguishing Risk of Progressive CKD (DROP CKD Study)
- Dr Louise Purtell: The Kidney Supportive Care Program (KSCp)
- Dr Jenny Zhang: CKD Hospital Utilisation: Qld Health Data Linkage project
- Dr Samuel Chan: BMI in an Australian population with CKD, and
- Ms Kathryn Havas: Person-centred care in CKD: The CKD-SMS study



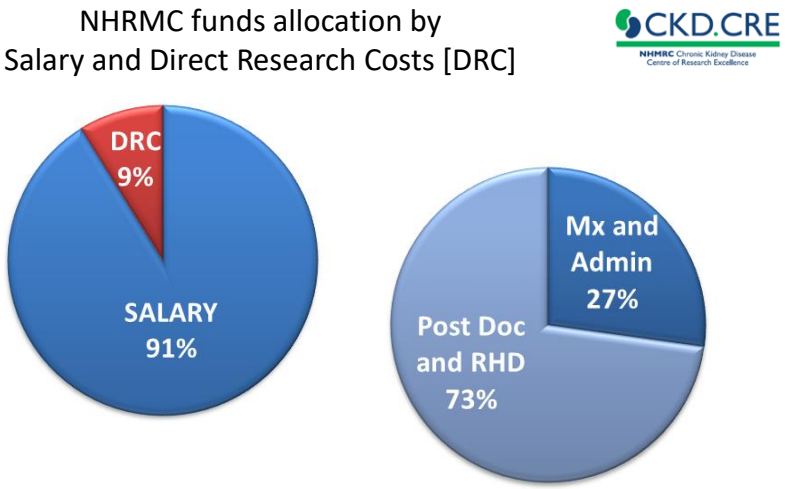
2017 NHMRC CKD.CRE Colloquium
Pictured L>R: Prof Ann Bonner, Prof Wendy Hoy, Prof David Harris, Ms Mikaela Stafrace, Dr Sree Krishna Venuthurupalli, Prof Geoff Mitchell, Prof Sean Emery, Mr Sri Sathiyendra, Prof Helen Edwards and A/Prof Glenda Gobe.

6. Budget and Funding

The NHMRC CKD.CRE was awarded a total of $2,469,981.45, with all expenditure to be in accordance with the requirements of the funding agreement, and inclusive of costs that were directly related to the grant proposal (direct research costs [DRC]). These DRCs were not to be used facility, administrative or other indirect costs that would be provided by an institution in the normal course of undertaking and supporting health and medical research.

The CRE budget allocation (**Figure 2**) was distributed over five years predominantly for salaries across the four themes of research (CKD Surveillance, Practice Improvement, Biomarker Research and Health Economics).

Figure 2: NHMRC 5-year funds by allocation



	2015	2016	2017	2018	2019	Total
Salary Costs	259,561.35	576,309.90	576,309.90	534,291.40	330,508.90	**2,276,981.45**
Direct Research Costs	50,000.00	65,000.00	35,000.00	35,000.00	35,000.00	**220,000.00**
Project Total	309,561.35	641,309.90	611,309.90	569,291.40	365,508.90	**2,496,981.45**

Of the 91% ($2,276,981) allocated for salaries, 73% went to support post-doctoral and research higher degree students. 9% ($220,000) was allocated for direct research costs in the Biomarker Research program.

As listed in **table 4** below, in addition to the $2,497,000 awarded by the NHRMC for the Centres' 5 year planned research activity, further project funding was raised in the amount of $1,968,351 with a further $475,000 pending project endorsements.

Table 4: Additional funding attained in support of NHMRC CKD.CRE research activities.

Funder	Project	Year(s)	$ Amount (ex GST)
The University of Queensland	Deputy Vice Chancellor (Research)	2015-2019	250,000
Queensland Health Innovation Fund	Keeping Kidneys project	2015-2017	124,000
Pan American Health Organization	CKD in Central American agricultural communities	2015	27,000
Sanofi-Genzyme	aCQuiRE study	2016-2019	946,554
Australian Centre For Health Services Innovation (AusHSI)	Evaluating the implementation of a kidney supportive care program	2016-2017	149,997
AMGEN Australia	CKD.QLD philanthropic donation	2015-2016	90,000
AMGEN Australia	CKD.NET meeting sponsorship	June 2015	10,000
AMGEN Australia	Audit 4 extraction tool development	Feb 2016	30,000
AMGEN Australia	NHMRC CKD.CRE Colloquium	July 2015	4,000
Genzyme Australia	NHMRC CKD.CRE Colloquium	July 2015	1,800
AstraZeneca	Anaemia & Chronic Kidney Disease	2019-2020	160,000
UQ Global Change Institute	Safe Water Coalition	2017	160,000
UQ Faculty of Medicine Collaborative Grant Workshop	Groundwater contamination and kidney health in remote Indigenous Australia	2018	5,000
UQ SPH Building Research Capacity - seeding grants	Groundwater contamination and kidney health in remote Indigenous Australia	2018	5,000
Australian Nuclear Science and Technology Organisation (ANSTO)	Sponsorship of the UQ Safe Water Summit	2018	5,000
QH Aboriginal & Torres Strait Islander Health Division	Expanded economic analysis of patients with chronic diseases	pending	*(75,000)*
AstraZeneca	Phase 2: Impact of anaemia on hospital admissions, costs and outcomes in CKD and non-CKD patients	pending	*(250,000)*
Astellas	The transplant patient journey (hospital admissions, costs and outcomes	pending	*(150,000)*
TOTAL	**Actual** *(Pending)* *(Actual + pending)*		**$1,968,351** *(475,000)* *($2,443,351)*

As listed in **table 5** below, the Centre also supported successful grant applications by affiliated institutions, totalling $12,720,858.

Table 5: Funding attained by other programs assisted by the NHMRC CKD.CRE

Funder	Project lead institution	Project	Year(s)	$ Amount (ex GST)
NHMRC Ideas Grant	The University of Queensland	Advancing non-discriminatory, rights-based access to health services for Aboriginal & Torres Strait Islander peoples	2021-2023	1,143,384
NHMRC Clinical Trials and Cohort Studies	Menzies School of Health Research, Darwin	Progression of chronic kidney disease in Aboriginal and Torres Strait Islander adults: the eGFR3 Cohort Study	2020-2024	3,900,000
Medical Research Future Fund	Queensland University of Technology	Genomic architecture of chronic disease in Australia's First Peoples	2020-2023	1,400,000

NHMRC Project Grant	University of Newcastle	The Relationship between Maternal Health and Infant Renal Development and Function	2019-2020	1,600,000
NHMRC Project Grant	Menzies School of Health Research, Darwin	Early life & contemporary influences on body composition, mental health & chronic disease risk markers in the Aboriginal Birth Cohort. Wave 5	2018-2022	3,100,000
NHMRC Project Grant	The University of Melbourne	A simulation model to improve CV risk prediction and treatment for indigenous Australians	2016-2018	580,985
NHMRC Project Grant	The University of Adelaide	Periodontal disease and chronic kidney disease among Aboriginal adults; an RCT.	2015-2018	996,489
TOTAL				**$12,720,858**

7. Consumer Engagement

With support of Dr Tim Matthews, Medical Director and Mikaela Stafrace, CEO of Kidney Health Australia (KHA), and the manager of Queensland's Kidney Support Network (KSN), delegates from KHA and KSN accepted consumer engagement CRE roles.

Amber Williamson, KHA Health Project Officer (Qld). Amber is a kidney transplant recipient and dedicated to improving lives of kidney patients. She has been a Project Officer for KHA, provided Secretarial Support to the KHA QLD Consumer Committee and was the Consumer Representative on the QLD Statewide Clinical Renal Network. Amber facilitated community engagement via KHA's National Consumer committees.

Bethel O'Keefe, Indigenous Health Office, KSN (Qld).
We remember Bethel with great respect. She had been the recipient of two kidney transplants, and was self-managing home haemodialysis at the end of her life. A long standing and eminent consumer advocate, Bethel joined KSN in 2008. To hear some of Bethel's inspiring journey please visit here.

8. Peripheral Programs

The CRE has also partnered in eight state, national and international peripheral programs, as follows.

8.1 aCQuiRE (Ckd.Qld fabRy Epidemiology) Study.

aCQuiRE is a study of Fabry Disease prevalence among CKD patients managed in the public health system of Queensland, Australia. Fabry disease is an X-linked disorder caused by dysfunction of the lysosomal enzyme, alpha galactosidase A (GLA) which leads to the abnormal accumulation of the lipid globotriaosylceramide which can lead to potentially life-threatening complications. Diagnosis is important because Fabry disease is potentially treatable with enzyme replacement therapy, which may result in increased quality and duration of life. The study also offered screening of family members of any person identified with Fabry Disease, aiming to detect and treat early disease before complications arise.

The study was led by Prof Wendy Hoy (Principal Investigator) and Prof Andrew Mallett (Coordinating Principal Investigator). It is sponsored by The University of Queensland and funded by Sanofi-Genzyme. Anne Salisbury RN was critical in its design and Phoebe Kearey (B. Arts (Psych); M. Heath Science) was the Study Coordinator.

The Study received multi-site ethics approval from the Royal Brisbane & Women's Hospital's Health Research Ethics Committee in April 2017 [HREC/17/QRBW/91] and Governance approval for the RBWH, Cairns, Logan, Toowoomba (including Kingaroy), Mackay, Hervey Bay and Gold Coast.

The target of 3,000 patients screened by dried blood spot (DBS) testing was reached in August 2019, with Lyso-GB3 and/or DNA testing following where results were inconclusive or suggestive of Fabry disease.

A manuscript describing the aCQuiRE Study Protocol was published in BMC Nephrology in 2020 and another describing study outcomes is under review, with abstracts submitted to the 2020 American Society of Nephrology Kidney Week and the Australian and New Zealand Society of Nephrology Annual Scientific Meeting. A description of the study was also presented at state, national & international meetings.

For further details, including investigator and site details, please see Appendix E.

8.2 Queensland Renal Biopsy Registry (QRBR)

Under the leadership of Assoc Prof Dwarakanathan Ranganathan, a registry of patients with biopsy-proven kidney disease was established through the collaboration of nephrologists from across Queensland public hospitals, Pathology Queensland and The University of Queensland. QRBR is the first state-wide registry of renal biopsy data in Australia. The registry is in keeping with the directions of the Queensland Health Advancing Kidney Care 2026 Plan, released in 2019. This multi-site registry is coordinated by the Kidney Health Service, Metro North Hospital and Health Service, under ethical approval (HREC Ref No. 38653).

Phase 1 of the registry entailed retrospective acquisition of data from all adult native kidney biopsies performed in Queensland, Australia, from 2002 to 2018. Data were also linked with the CKD.QLD patient registry. Phase 2, from 2019 onwards, involves prospective collection of all consenting patients referred to Queensland public hospitals and having a renal biopsy. 120 participants were registered as of April 2021.

This registry provides opportunities for better understanding nature, distribution, epidemiology, treatment responses and longitudinal course of renal disorders in the state, and thus support better patient care, management decisions and research.

8.3 Tiwi Islands Kidney Disease Program

Dr Hoy's team continues the Centre's study of kidney disease in Tiwi Islanders, now in its 29th year. Current activities include extension of longitudinal data on people who underwent a health check in 1992 and updating outcomes of the Tiwi Birthweight cohort, (born 1956-1985). It also includes, in collaboration with QUT and funded by an MRFF Genomic Futures grant (to QUT), conduct of whole genome sequencing (WGS) on DNA from Tiwi donors whose clinical status and longitudinal progression has been profiled. That project will help define the Tiwi genome as well as the genetic architecture of enhanced susceptibility to diabetes and kidney disease. The teams work closely with the National Centre for Indigenous Genomics (NCIG) at the John Curtin School of Medical Research in Canberra, and with research partners at the ANU.

8.4 Advancing non-discriminatory, rights-based access to health services for Aboriginal and Torres Strait Islander peoples.

Our Centre is a partner and Prof Hoy is a CI in an NHMRC project funded in 2020 through the IDEAS grant systems which addresses Health as a Human Right in Queensland's Indigenous (ATSI) populations. A/Prof Maree Toombs is designated CIA, and Dr Claire Brolan was massively instrumental in the conceptualisations, writing and grant success. We will contribute in two ways. First we will analyses the

CKD.QLD demographic and hospital admission datasets, looking for gaps and opportunities in hospital-based health care provision to our ATSI population. With feedback to funders, this could lead to cycles of practice improvement and better outcomes. The second is to assist, through our Tiwi genome profiling work, and links to the NCIG to help build knowledge and capacity of Indigenous people and researchers in genomic research in indigenous people.

8.5 Chronic Kidney Disease of Unknown origin (CKDu)

The Centre has supported research of, and advocacy for, chronic kidney disease of unknown origin (CKDu), a more recently recognised global phenomenon with devastating health implications.

Collaborating bodies include the World Health Organisation (WHO); the Pan American Health Organisation (PAHO); Centres for Disease Control, National Institutes of Health, USA; Sri Lankan Ministry of Health and Peradeniya University, Sri Lanka; La Isla Foundation, El Salvador; and the Australian Nuclear Science and Technology Organisation (ANSTO).

Professor Hoy is an Expert Consultant with PAHO and Central American agencies in relation to CKDu aetiology in Central America; and with the World Health Organisation, the Sri-Lankan CKDu Research Task Force and ANSTO in Sri Lanka. She was also Guest Editor of MEDICC Review, the International Journal of Cuban health and Medicine for its special issue.

Following commissions in 2015 and 2016, Prof Hoy co-edited a landmark PAHO technical report (published in 2017) entitled: *Epidemic of chronic kidney disease in agricultural communities in Central America. Case definitions, methodological basis and approaches for public health surveillance:* She also co-authored a manuscript on chronic kidney disease mortality trends in Central America (J Epi & Comm Health, 2018).

In 2017 Prof Hoy was co-chair of the CKDu Intervention Working Party, an initiative of the International Society of Nephrology (ISN), and co-chaired the plenary session of 11th Conference on Kidney Disease in Disadvantaged populations, World Congress of Nephrology Conference/ISN, Santiago de Queretaro, Mexico. She remains engaged in this issue through her role as a supervisor of a Sri Lankan nephrologist, who has received a prestigious UQ International PhD scholarship to study this issue, Dr Rajitha Abeysekera, who earlier did research projects on CKD progression on our CKD.QKLD data set.

8.6 Safe Water

8.6.1 Safe Water Summit. A safe, sustainable water supply for remote-living Indigenous Australians

Safe Water was established in September 2018 at The University of Queensland (UQ) by Professor Wendy Hoy, Director of the Centre for Chronic Disease and the NHMRC Chronic Kidney Disease Centre of Research Excellence, UQ, and Dr Nina Hall, School of Public Health, UQ after a successful grant application to The University of Queensland Global Change Institute's Flagship Project (2018-2020). Seed funding from ANSTO- Australia's Nuclear Science and Technology Organisation and UQ's School of Public Health and UQ Faculty of Medicine, is also gratefully acknowledged.

The original focus of the project was to better understand barriers to access to safe drinking water in remote and semi-remote areas.

An inaugural Safe Water Summit, attracting 64 attendees, was held in Brisbane in November 2018. Attendees came from a wide range of sectors and disciplines. Thirty expert presentations were delivered by representatives of remote Indigenous Communities, the water and water services industries, State and

Federal Governments, and, the university sector Australia-wide. The program and abstracts are available here. In preparation for, and as a results of that summit, membership of the Safe Water coalition has grown substantially, with all states, excluding Tasmania, and the NT represented.

8.7 The MRI Kidney Imaging and Nephron Counting Project.

The Centre partnered with other national and international collaborators in an initiative led by Prof David Reutens of UQ's Centre for Advanced Imaging (CAI) to develop non-invasive Magnetic Resonance Imaging (MRI) diagnostic and prognostic tools for the kidneys. The exciting innovation is their iterative application to ambulatory humans without adverse events. The tools will, for the first time, quantify glomerular number (a surrogate for nephron number) and glomerular volume without further interventions. The concept is born out of 25 years of collaborative work of Hoy, Bertram and Hughson, defining the association of glomerular number and volume with susceptibility to kidney disease, hypertension and cardiovascular risk. A proposal is now under consideration in the current cycle of MRFF and NHMRC funding. The proposal includes application of tools in people with deep definition shared phenotypes in the CKD.QLD Registry, the paediatric nephrology patients of Dr Peter Trnka (Queensland Children's Hospital) and several Indigenous groups, both urban and remote.

8.8 Providing kidney care close to home: evaluating the Cape York Kidney Care Model (2021).

Chronic Kidney Disease (CKD) is associated with significant morbidity and mortality, with a disproportionately higher prevalence and impact within the Aboriginal and Torres Strait Islander Peoples of Australia. A pathology audit in the western Cape York Indigenous communities identified the prevalence of moderate to severe CKD was three to ten times higher than national rates, and that there was significant under-servicing of tertiary level kidney services in these remote communities. To provide better kidney care the Cape York Kidney Care (CYKC) team was formed in September 2019 to address this gap in tertiary level services. CYKC was informed by evidence that current models of care are deficient in providing accessible education about kidney care, and health care should be client-centred, respectful and culturally appropriate.

The CYKC service is an integrated and multidisciplinary care team consisting of a rural generalist with advanced skills in adult internal medicine, a nephrology nurse practitioner, an Aboriginal and Torres Strait Islander health practitioner, a dietitian and a pharmacist, with remote support by a tertiary-based nephrologist. People with CKD engage with the CYKC team in their community via a yarning style of consult, with patient-directed education provided, and health goals/care plan and review frequency mutually decided. Tertiary input is received via integrated case conferences in which the outcome of the consult is discussed and relayed to primary care and allied health members of the client's care team to facilitate effective communication and horizontal and vertical translation of knowledge between care providers.

The project has an overarching research question: "Does a multidisciplinary, integrated and patient-centred kidney care team provide increased access to specialist Nephrology services in a cost-effective manner, and improve health outcome measures for Aboriginal and/or Torres Strait Islander people living with chronic kidney disease in western Cape York?" This question will be answered through a mixed-method study design.

9. NHMRC CKD.CRE Extension

In May 2019, Professor Hoy, on behalf of the CRE Management Committee, was successful in applying for a 12-month extension to the existing contract with the NHMRC for the Chronic Kidney Disease Centre of Research Excellence. The NHMRC CKD.CRE was originally scheduled to finish in Nov 2019 with the final report due May 2020.

Extension was approved until November 2020, supporting the completion of (multiple) projects, reports and publications, including presentations of outcomes to state, national and international meetings.

The NHMRC CKD.Biobank also benefitted from the extension to refine governance and curate functions and completion of Evan Owens doctoral studies.

The background to extension request was based on two elements:

1. The Centre's Senior Data Manager needed 18 months of carer leave which severely compromised project functions.

2. Response to a challenge to CKD.QLD interrupted and consumed extensive time and efforts of Centre management and the already depleted analytic team. The specific challenge was an open charge of defective quality of care in one site alleged by another site, based on comparisons of their estimated respective rates of deaths and kidney replacement therapy. The explanation for different rates was ultimately found to lie in missing data as supplied by the challenging institution. An external review said findings 'largely dispels the concerns raised of the original reports' and that 'there is not a statistically significant difference in outcomes of 'death prior to KRT' or 'rates of KRT' between the institutions.' The reviewed described CKD.QLD as valuable resource for research in the pre-kidney replacement chronic kidney disease population'.

An unfortunate fallout of that challenge, and even though the detective data of the challenging site were ultimately repaired, was the decision to close that particular site as a CKD.QLD Registry site; all patients consented at that site were removed from the central Registry, and excluded from future reporting. This decision was enacted in January 2018, with loss of about 1,250 recruited patients, together with their longitudinal data and linked admissions data, from the Registry and subsequent downstream programs.

In addition to supporting the external review, Prof Hoy led meetings with the then chair of the RBWH Ethics Committee (Dr Allison Sutherland), and submitted both an Annual Research Report summarising the closure, and an affiliated protocol amendment. In parallel with Ethics communications, the Centres' Consultancy and Engagement committee and The University of Queensland Office of Sponsored Research were contacted to brief them of the events and kept informed of outcomes.

The estimated loss from the senior data manager leave and the challenge and consequent external review is 2.5 years full-time equivalency. With the return to "research-as-usual", the Centre's work schedule was revised with existing (human) resources and was scoped to complete in November 2020.

10. NHMRC CKD.CRE legacy summary

The CRE's findings on age, causes, progression, and hospital costs of people with CKD, and regional and ethnic variations, can inform prevention and treatment approaches, and predictions of outcomes for policy and planning. This is much more heterogeneous group than the subgroup that eventually receives dialysis.

Many people with CKD have survived well beyond life expectancy of their birth cohort: quality of life and holistic care are priorities, with dialysis often not desired or appropriate.

Yet CKD progression is not inevitable and is probably modifiable. In Queensland, through a collaboration with Queensland Health (QH), we are have and continue to define trends and outcomes in hospital admissions since 2011, in persons with and without CKD (52,800 patients; 998,000 admissions). One current application is study of avoidable hospital admissions through traditional and Machine Leaning approaches.

We supported and continue to support the QH Advancing Kidney Care 2026 Plan in the acute kidney injury (AKI) and kidney supportive care (KSC) streams, and the new Western Cape, Torres and Cape Hospital and Health Services' "Kidney Care Close to Home". We are defining "Gaps & Opportunities" in admissions of Indigenous people in the NHMRC-funded project "Health as a Human Right".

Finally, the CKD.QLD Registry continues as a potential hub for clinical trials. In Australia, CRE data will inform AIHW's surveillance of CKD, and its Global Burden of Disease & Indigenous subset analyses. We promote data interfaces with ANZDATA for CKD patients who start kidney replacement therapies. Globally, we continue to collaborate with the International Network of CKD Study Cohorts, and support CKDu research, especially in Central American and Sri Lanka. We are studying AKI in a global dataset of COVID-19 patients. The Tiwi genomic and pharmaco-genomic research will have broad international applicability. We co-lead, with The University of Queensland's Centre or Advanced Imaging, a multinational initiative in MRI renal imaging to estimate glomerular number and volume, which are important CKD prognostic factors.

This report collates the achievements of the Centre across its themes of research: chronic kidney disease surveillance, practice improvement, biomarker research, and health economics. Fundamentally, the Centre has supported new knowledge, education and capacity towards improving kidney health, patient care and outcomes, and the fostering of positive engagement and collaboration. Its legacy is expansive.

Appendix A: NHMRC CKD.CRE Investigators

CKD.CRE Chief Investigators

Prof Wendy Hoy
Director of the Centre for Chronic Disease,
Faculty of Medicine, UQ

Assoc Prof Helen Healy
Director, Kidney Health Service, Metro North Hospital and Health Service, Queensland Health

Professor Geoff Mitchell
Primary Care Clinical Unit,
Faculty of Medicine, UQ

Professor Ann Bonner
School of Nursing, QUT
Visiting Research Fellow, Kidney Health Service,
Metro North Hospital and Health Service, QH

Professor Luke Connelly
Acting Director
Centre for the Business and Economics of Health
Faculty of Business, Economics and Law, UQ

Associate Professor Kathryn Panaretto
Public and Indigenous Health,
James Cook University

Professor Zoltan Endre
Head, Dept of Nephrology, Prince of Wales Hospital
Prof of Medicine, UNSW

Professor Jeff Coombes
Centre for Research on Exercise, Physical Activity and Health, School of Human Movement & Nutrition Sciences, UQ

Associate Professor Glenda Gobe
The University of Queensland Diamantina Institute
Director (Research Training), Research Strategy and Support (Medicine), Faculty of Medicine UQ

Professor Robert Fassett
School of Human Movement and Nutrition Sciences, UQ

CKD.CRE Associate Investigators

Professor Mark Brown
Director, St George & Sutherland Renal Service, NSW; St George & Sutherland Clinical School, UNSW

Professor Matt Jose
Professor of Medicine, University of Tasmania,
Nephrologist, Royal Hobart Hospital

Professor Ben White
Professor, Australian Centre for Health Law Research, Faculty of Law, School of Law, QUT
Honorary Professor, Faculty of Medicine, UQ

Professor Patsy Yates
Head, School of Nursing, Faculty of Health, QUT - Institute of Health Biomedical Innovation (IHBI)
Director, Centre for Palliative Care Research & Education, Queensland Health

Associate Professor Craig Nelson
Director – Nephrology, Western Health, Victoria
Honorary, North West Academic Centre,
The University of Melbourne

Dr Carol Douglas
Director, Palliative and Supportive Care Service, RBWH, Queensland Health
President of Australian New Zealand Society of Palliative Medicine

Dr Hemant Kulkarni
Clinical Lead of Renal Health Network, Department of Health, Western Australia; Senior Nephrologist,
East Metropolitan Health Services, WA

Dr Ken-Soon Tan
Director, Renal Medicine, Metro South Hospital and Health Service – Logan Hospital
Senior Lecturer, School of Medicine, Griffith University

Dr David Waugh
Nephrologist, Royal North Shore Hospital, Sydney NSW;
Chairperson of eKiDNAA (Electronic Kidney Disease National Audit Alliance)

Mr Dallas Leon
CEO of, Gidgee Healing, Mt Isa Aboriginal Community Controlled Health Service, Qld

Appendix B: Consultancy and Engagement Committee

The roles and functions of the Consultancy and Engagement Committee were to:

- provide advice and support in the enabling of the Centre, as indicated
- provide strategic guidance in the translation of the CRE outcomes
- recognise barriers and enablers of translational opportunities e.g. grants and research collaborations, and assist/provide advice in developing initiatives to address these
- assist in the promotion of the NHRMC CKD.CRE

The NHRMC CKD.CRE Consultancy and Engagement Committee was comprised of:

Prof David Harris (Committee Chair)
President; International Society of Nephrology
Professor of Medicine, The University of Sydney

Prof Sean Emery
Deputy Executive Dean and Research Dean
Faculty of Medicine, The University of Queensland

Prof Helen Edwards
Assistant Dean (International and Engagement)
Faculty of Health, Queensland University of Technology

Ms Mikaela Stafrace
Chief Executive Officer, Kidney Health Australia [KHA]

Mr Sri Sathiyendra
Manager, Credit, Commercial & Private QLD & NT
Australia and New Zealand Banking Group

Appendix C: Funded Research Personnel and Project Officers

Dr Zaimin Wang
Post-doctoral Research Fellow, Centre for Chronic Disease, Faculty of Medicine, UQ

Dr Jenny Zhang
Post-doctoral Research Fellow, Centre for Chronic Disease, Faculty of Medicine, UQ

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Post-doctoral Research Fellow, Centre for Chronic Disease, Faculty of Medicine, UQ

Dr Marcin Sowa
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Centre for Business and Economics of Health, UQ

Dr Lena Succar
Post-doctoral Research Fellow
Prince of Wales Clinical School,
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Dr Louise Purtell
Post-doctoral Research Fellow
School of Nursing, Faculty of Health, QUT

Dr Vishal Diwan
Research Coordinator/Senior Research Assistant CKD.QLD & NHMRC CKD.CRE, Centre for Chronic Disease

Ms Anne Cameron,
Manager, CKD.QLD & NHMRC CKD.CRE,
Centre for Chronic Disease, Faculty of Medicine, UQ

Ms Phoebe Kearey
Project manager: aCQuiRE Study,
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Ms Carolyn Hinds-Edwards
Senior Administration Officer,
Centre for Chronic Disease, Faculty of Medicine, UQ

Ms Susan Mott
Senior Research Officer
Centre for Chronic Disease, Faculty of Medicine, UQ

Ms Julie Kirby
Research Assistant
Centre for Chronic Disease, Faculty of Medicine, UQ

Appendix D: CKD.QLD Investigator and site personnel

Principal Investigators

- **Prof Wendy E Hoy;** Director, Centre for Chronic Disease, School of Clinical Medicine, The University of Queensland
- **Prof Robert G Fassett;** School of Human Movement and Nutrition Sciences, The University of Queensland
- **A/Prof Sree Krishna Venuthurupalli;** Faculty of Medicine, The University of Queensland

Operational, Research Fellows and Senior Assistants

- **Dr Zaimin Wang;** Senior Research Fellow, Centre for Chronic Disease, School of Clinical Medicine, UQ
- **Dr Jenny Zhang;** Senior Research Fellow, Centre for Chronic Disease, School of Clinical Medicine, UQ
- **Dr Vishal Diwan;** Senior Research Assistant, Centre for Chronic Disease, School of Clinical Medicine, UQ
- **Ms Anne Cameron (Salisbury);** Research Manager, Centre for Chronic Disease, School of Clinical Medicine, UQ

Queensland Health Site Investigators, Coordinators and Supporters

Hospital and Health Service (Renal service)	Site Investigators, *Coordinators and Supporters*
Cairns and Hinterland (Cairns Renal Service)	Dr Murty Mantha, Dr Richard Baer; *Ms Stella Green, John Killen, Lois Burlund*
Central Queensland (Rockhampton Renal Service)	Dr Thin Han; Dr Murty Divi; *Ms Katrina Duff*
Darling Downs (Darling Downs Renal Service)	Dr Sridevi Govindarajulu; Dr Sree Krishna Venuthurupalli; *Mr John Fanning; Ms Ada Stevenson; Ms Rebecca Barton; Ms Andrea Rolfe; Ms Robyn Bailey*
Gold Coast (Gold Coast Renal Service)	A/Prof Thomas Titus; *Ms Michelle Harvey; Ms Rachael Brown*
Mackay (Mackay Renal Service)	Dr Danielle Wu; Dr Roy Cherian; Ms Chris Banney; *Ms Jo Ashford*
Metro North (Kidney Health Service)	A/Prof Helen Healy; A/Prof Dwarakanathan Ranganathan; Dr Adrian Kark, Prof Andrew Mallett, *Ms Sonya Coleman; Ms Bernadette Taylor, Ms Anne Salisbury; Mr Sonny Huynh; Ms Anitha Dinesh, Ms Robyn Moyle*
Metro South (Logan Renal Service)	Dr Ken-soon Tan; *Ms Cassandra Stone; Ms Erica Lennan; Ms Anne Dunn; Mr Andrew Winn; Ms Lauren Jaffrey*
Sunshine Coast (Sunshine Coast Renal Service)	Dr Nicholas Gray, *Ms Andrea Pollock*
Townsville (Townsville Renal Service)	Dr George Kan; Dr Valli Manickan; Dr Vikas Srivastava; *Ms Stamatina Katsanevas*
Wide Bay (Hervey Bay/Maryborough and Bundaberg Renal Services)	Dr Krishan Madhan; Dr Clyson Mutatiri; Dr Shahadat Hossain; Dr Peter Miach: *Ms Barbara Harvie; Ms Leanne Brown; Mandy Zweedyk*
Primary Care	
Inala Primary Care Ltd (Keeping Kidneys)	Ms Tracey Johnson; Dr Suzanne Williams; *Dr Robin Armstrong; Dr David Chua; Mr Chris Smead*
Limestone Medical Centre (Keeping Kidneys)	Dr Geoff Mitchell

Appendix E: aCQuiRE Investigator and site personnel

The aCQuiRE Principal Investigators would like to acknowledge the research nurses at each site for consenting, screening, data collection and follow-up of patients, in particular, the Site Coordinators (Dr Leanne Brown, Belinda Elford, Erica Lennan, Stella Green, Chris Banney, Ian Fox, Rita Faulks and Carmen Crawshaw). Screening is conducted under the oversight of site lead investigators (Dr Ken Soon Tan, Dr Shyam Dheda, Dr Roy Cherian, Dr Krishan Madhan, Dr Sree Krishna Venuthurupalli, Dr Dakshinamurthy Divi and Dr Helen Healy). All pathology samples are analysed by the Genetics and Molecular Pathology laboratory of South Australia Pathology under the management of Associate Professor Maria Fuller.

aCQuiRE Investigators	**Site**, Investigators and *Coordinators*
Prof Wendy Hoy – Principal Investigator Director of the Centre for Chronic Disease, Faculty of Medicine, The University of Queensland	**Kidney Health Service, Royal Brisbane and Women's Hospital, Metro North HHS** Prof Helen Healy and A/Prof Andrew Mallett *Ms Belinda Elford and Ms Julie Kirby*
Prof Andrew Mallett – Coordinating Principal Investigator Faculty of Medicine & Institute for Molecular Bioscience The University of Queensland; Kidney Health Service, Metro North Hospital and Health Service, Queensland Health; Department of Renal Medicine, Townsville Hospital and Health Service, Queensland Health; The KidGen Collaborative, Australian Genomics Health Alliance, Melbourne, Victoria	**Renal Service, Cairns Hospital, Cairns and Hinterland HHS** Dr's Murty Mantha and Shyam Dheda *Ms Natalie Grainer and Ms Stella Green*
Ms Phoebe Kearey Program Manager, aCQuiRE Study Faculty of Medicine, The University of Queensland	**Renal Service, Logan Hospital, Metro South HHS** Dr Ken-soon Tan *Ms Erica Lennan*
Dr Helen Healy Director, Kidney Health Service, Metro North Hospital and Health Service, Queensland Health	**Darling Downs Renal Service, Toowoomba Hospital, Darling Downs HHS** Dr's Sree Krishna Venuthurupalli, Alok Gupta, Alice Lee and Usman Mahmood *Mr Ian Fox*
A/Prof Charles Denaro Queensland Statewide Fabry Disease Treatment Service; Faculty of Medicine, The University of Queensland Department of Internal Medicine and Aged Care, Royal Brisbane and Women's Hospital, Queensland Health	**Renal Service, Mackay Hospital, Mackay HHS** Dr Roy Cherian *Ms Christine Banney*
Prof Mark Thomas Senior Nephrologist, Department of Nephrology, Royal Perth Hospital, Western Australia	**Fraser Coast Renal Service, Hervey Bay Hospital, Wide Bay HHS** Dr Krishan Madhan *Dr Leanne Brown*
Dr Vincent Lee Senior Nephrologist, Department of Nephrology, Westmead Hospital, Sydney, New South Wales	**Renal Service, Gold Coast University Hospital, Gold Coast HHS** Dr Murty Divi *Ms Carmen Yaxley*
Maria Fuller Genetics and Molecular Pathology Laboratory, South Australia Pathology, Adelaide, South Australia	
Ms Anne Cameron (Salisbury) Manager, CKD.QLD & NHMRC CKD.CRE Faculty of Medicine, The University of Queensland	

Appendix F: Publications and Presentations

Manuscripts

Chronic Kidney Disease Surveillance

1. Ordunez P, Hoy WE. *Case definitions and new approaches for surveillance of chronic kidney disease in agricultural communities in Central America.* Policy implications. Kidney International. 2018;93(2):284-287. DOI 10.1016/j.kint.2017.10.029 OA. https://pubmed.ncbi.nlm.nih.gov/29389389/

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Indigenous Populations

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Foetal Alcohol and Cardio-Renal Outcomes

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CKD Symptom Burden

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Models of Care

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Self-management

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COVID-19

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Book Chapters

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2. Bonner, A. (2019). *Adaptation of nursing assessment: Urinary system.* In D. Brown, H. Edwards, L. Seaton, & T. Buckley. (Eds). Lewis's Medical-Surgical Nursing. (5th ed.). Sydney: Elsevier. ISBN: 9780729543095.
3. Bonner, A. (2019). *Adaptation of nursing management: Renal and urologic problems.* In D. Brown, H. Edwards, L. Seaton, & T. Buckley. (Eds). Lewis's Medical-Surgical Nursing. (5th ed.). Sydney: Elsevier. ISBN: 9780729543095.
4. Bonner, A. (2019). *Adaptation of nursing management: Acute kidney injury and chronic kidney disease.* In D. Brown, H. Edwards, L. Seaton, & T. Buckley. (Eds). Lewis's Medical-Surgical Nursing. (5th ed.). Sydney: Elsevier. ISBN: 9780729543095.
5. Pianta TJ, Gobe GC, Ownes EP, Endre ZH (2018). *Overview of pathophysiology of acute kidney injury: human evidence, mechanisms, pathological correlations, biomarkers and animal models*. In: Waikar S, Murray P, Singh A (eds) Core concepts of Acute Kidney Injury. Springer, New York, NY.
6. Hryciw, D., & Bonner, A. *Fluids and electrolytes, acids and bases.* In J. Craft, & C. Gordon. (Eds). Understanding Pathophysiology. (3rd ed.). 2018
7. Hryciw, D., & Bonner, A. *Alterations of renal and urinary tract function across the lifespan*. In J. Craft, & C. Gordon. (Eds). Understanding Pathophysiology. (3rd ed.). 2018
8. Bonner, A., & Douglas, B. Chronic kidney disease. In E. Chang & A. Johnson (Eds). *Chronic Illness and Disability: Principles of Nursing Practice.* (3rd ed.). 2018.

Published Reports

1. Bonner A, Douglas C, Abel J, Barnes M, Stone C, Hetherington J, Havas K, Bashi N (2015). *Integrated chronic disease nurse practitioner service evaluation report.* Brisbane, Queensland: Queensland University of Technology.
2. Safe Water Summit. *A safe, sustainable water supply for remote-living Indigenous Australians.* November 2018. Brisbane, Queensland, The University of Queensland.
3. Project team: Campbell A, Dimaano A, Hansen C. Project Supervisor: Currell M. *Securing Safe Supplies for Remote Communities in Western Australia. Final Report.* 2020, Optimus Group, RMIT University, The University of Queensland.

CKD.QLD Reports

1. Hoy WE, Healy HG, Connelly L, Bonner A, Wang Z, Cameron A. *Summary Report: AUSHI SG0015-000543: The Impact on hospital utilisation and costs of proactive planning for conservative treatment without dialysis in selected patients with advanced kidney disease.* CKD.QLD, Centre for Chronic Disease, The University of Queensland. Brisbane, May 2015.
2. Hoy WE, Wang Z, Mott SA, Cameron A. *CKD.QLD Haem Report.* CKD.QLD, Centre for Chronic Disease, The University of Queensland. Brisbane, May 2015.
3. Hoy WE, Wang Z, Zhang J, Cameron A. *CKD.QLD: Profile of CKD patients from the Darling Downs Hospital and Health Service: First site report.* Centre for Chronic Disease, University of Queensland; June 2015.
4. Hoy WE, Wang Z, Zhang J, Cameron A. *A CKD.QLD Registry Report for the Princess Alexandra Hospital Department of Nephrology, Metro South Hospital and Health Service.* Centre for Chronic Disease, University of Queensland; May 2016
5. Hoy WE, Wang Z, Zhang J, Cameron A. *CKD.QLD Registry Report for the Kingaroy General Hospital renal satellite service.* Centre for Chronic Disease, The University of Queensland; June 2016

6. Hoy WE, Wang Z, Zhang J, Cameron A. *A CKD.QLD Registry Report for the Logan Hospital Renal Unit, Metro South Hospital and Health Service.* Centre for Chronic Disease, University of Queensland; July 2016.
7. Wang Z, Zhang J, Hoy WE. *Keeping Kidneys Limestone Medical Centre CKD.QLD Report.* Centre for Chronic Disease, UQCCR, Faculty of Medicine, The University of Queensland; 2016
8. Zhang J, Wang Z, Hoy WE. *Keeping Kidneys Inala Primary Care CKD.QLD Report.* Centre for Chronic Disease, UQCCR, Faculty of Medicine, The University of Queensland; 2016:
9. Hoy WE, Wang Z, Diwan V, Zhang J. *CKD.QLD Registry: CKT Kidney Health Service, a specific model of care report for Metro-North Hospital and Health Service.* Centre for Chronic Disease, The University of Queensland; June 2019.
10. Hoy WE, Wang Z, Diwan V, Zhang J. *CKD.QLD Registry Site Report for Townsville Hospital and Health Service Renal Services.* Centre for Chronic Disease, The University of Queensland; September 2019.
11. Hoy WE, Wang Z, Diwan V, Zhang J. *CKD.QLD Registry Site Report for Logan Hospital and Health Service Renal Service*. Centre for Chronic Disease, The University of Queensland; November 2019.
12. Hoy WE, Wang Z, Diwan V, Zhang J. *CKD.QLD Registry Site Report for Metro-North Hospital and Health Service Kidney Health Service.* Centre for Chronic Disease, The University of Queensland; December 2019.
13. Hoy WE, Wang Z, Diwan V, Zhang J. *CKD.QLD Registry Site Report for Mackay Hospital and Health Service Renal Service.* Centre for Chronic Disease, The University of Queensland; January 2020.
14. Hoy WE, Wang Z, Diwan V, Zhang J. *CKD.QLD Registry Site Report for Darling Downs Hospital and Health Service Renal Service.* Centre for Chronic Disease, The University of Queensland; January 2020.
15. Hoy WE, Wang Z, Diwan V, Zhang J. *CKD.QLD Registry Site Report for the Kidney Health Service Cairns and Hinterland HHS*. Centre for Chronic Disease, The University of Queensland; May 2020.
16. Hoy WE, Wang Z, Diwan V, Zhang J. *CKD.QLD Registry Site Report for the Gold Coast Hospital and Health Service Renal Service.* Centre for Chronic Disease, The University of Queensland; June 2020.
17. Hoy WE, Wang Z, Diwan V, Zhang J. *CKD.QLD Registry Site Report for the Rockhampton Hospital Nephrology Service.* Centre for Chronic Disease, The University of Queensland; July 2020
18. Hoy WE, Wang Z, Diwan V, Zhang J. *CKD.QLD Registry Site Report for the Sunshine Coast Renal Service.* Centre for Chronic Disease, The University of Queensland; August 2020.
19. Hoy WE, Zhang J, Diwan V, Wang Z, Venuthurupallia SK, Healy HG. *The Burden and Management of Anaemia in Non-dialysis Dependent CKD patients: A Retrospective Cohort Study of two sites in the CKD.QLD Registry.* Centre for Chronic Disease, The University of Queensland; July 2020. Funded by AstraZeneca.

Presentations - Conferences and Meetings

2015

The NHMRC CKD.CRE Colloquium; July 2015

1. Hoy WE. Chair: Colloquium opening, Theme 1, 1st July, Welcome and Centre of Research Excellence (CRE) overview, NHMRC CKD.CRE: The First Colloquium.
2. Keynote speaker. HOY WE. *CKD Surveillance*, Session 1, Theme 1, 1st July, National Priorities in CKD Research, NHMRC CKD.CRE: The First Colloquium.
3. Hoy WE. Chair: Colloquium close, *A. Some Comments, B. Chronic Disease in Remote Indigenous Population in the context of the Population and Health Transition*, Session 2.

Human Research Ethics Committee MNHHS; July 2015

4. Invited Speaker. Hoy WE. *CKD.QLD and beyond.* Royal Brisbane & Womens Hospital, Brisbane.

Australian and New Zealand Society of Nephrology [ANZSN]; September 2015

5. Hoy WE, Healy HG, Bonner A, Mitchell G, Connelly L, Panaretto K, Endre Z, combes J, Gobe G, Fassett RG, Cameron A. *The NHMRC Chronic Kidney Disease Centre of Research Excellence (2015-2019)*. Poster
6. Wang Z, Hoy WE, Healy HG, Kirby J, Cameron A. *Hospitalisations, independent of, or before, renal replacement therapy (RRT), in chronic kidney disease (CKD) patients in the renal practices of the Royal Brisbane and Women's Hospital (RBWH) in Queensland*. Mini-Oral, 288-251.00.
7. Wilson GJ, Kark A, Mallett A, Cameron A, Wang Z, Kirby J, Healy HG, Hoy WE. *Acute kidney injury (AKI) associated with chronic kidney disease (CKD) in the renal practices of the Royal Brisbane and Women's Hospital (RBWH) through the CKD.QLD registry*. Poster.
8. Wang Z, Hoy WE, Healy HG, Kirby J, Cameron A. *Predictor of renal replacement therapy (RRT) and death in chronic kidney disease (CKD) patients in a major Queensland metropolitan public renal practice*. Mini-Oral, 288-256.00.
9. Curley H, Venuthurupalli SK, Hoy WE, Healy HG, Fassett RG, Cameron A, Wang Z. *CKD.QLD: burden of cardiac disorders in chronic kidney disease (CKD) from Darling Downs*. Poster
10. Sanghi P, Venuthurupalli SK, Hoy WE, Healy HG, Fassett RG, Cameron A, Wang Z. *CKD.QLD: major co-morbidities associated with chronic kidney disease (CKD) from Toowoomba region.* Poster
11. Venuthurupalli SK, Hoy WE, Healy HG, Fassett RG, Cameron A, Wang Z. *CKD.QLD: profile of chronic kidney disease (CKD) from Darling Downs Health and Hospital Service (DDHHS), Queensland.* Poster.
12. Mahmood U, Hoy WE, Kark A, Healy HG, Mallett A, Rawlings C, Wang Z, Kirby J, Coleman S, Cameron A. *Profiles of very elderly patients with chronic kidney disease (CKD) in the public renal specialty practices of the Royal Brisbane and Women's Hospital (RBWH) in Queensland*. Poster.
13. Mahmood U, Hoy WE, Kark A, Healy HG, Mallett A, Rawlings C, Wang Z, Kirby J, Coleman S, Cameron A. *Heterogeneity of chronic kidney disease (CKD) by age in an Australian metropolitan renal service*. Poster.
14. Venuthurupalli SK, Rolfe A, Fanning J, Skewes J, Cameron A, Hoy WE. *CKD.QLD: management of chronic kidney disease through tele-health: cutting miles-spreading smiles*. Poster

EDTNA/ERCA International Conference; September 2015

15. Heffernan D, Hoy WE, Salisbury A, Kirby J, Kark A, Coleman S, Taylor B, Wang Z, Bonner A and Healy HG. *Characteristics of older chronic kidney disease patients in public renal practices in Queensland, Australia.* Dresden, Germany

Queensland Health: Chronic Disease Management across the lifespan of Aboriginal and Torres Strait Islander People. November 2015

16. Invited Keynote Speaker. Hoy WE. *A better way for managing chronic disease in Aboriginal and Torres Strait Islander People in Queensland- an ongoing discussion*.

2016

American Society of Nephrology [ASN]; November 2016

17. Hoy WE. *Development of Renal Disease in Aboriginal People in a Remote Australian Community: a Probable Model of Oligonephronia.*
18. Hoy WE, Mott S, Swanson C, Sharma S and Nicol J. *The Rise of Kidney and Related Chronic Diseases in Remote-Living Australian Aboriginal People in the Context of Epidemiologic and Health Transition.*
19. Mahmood U, Hoy WE, Healy HG, Mallett AJ, Kark AL, Cameron (Salisbury) A, Wang Z, Abeysekera RA. *Heterogeneity of Chronic Kidney Disease with Age in a Major Metropolitan Renal Service*. Poster: SA-PO866.
20. Hoy WE, Healy HG, Wang Z, Zhang J, Abeysekera RA, Tan K-S, Cameron (Salisbury) A. *The Spectrum of Chronic Kidney Disease in Public Renal Services of Queensland, Australia: Data from the CKD.QLD Registry*. Poster: SA-PO907.

21. Wilson GJ, Mallett AJ, Kark AL, Tan K-S, Abeysekera RA, Wang Z, Healy HG, Hoy WE. *The Relationship between Cancer and Acute Tubular Necrosis in Patients with Chronic Kidney Disease.* Publication only: PUB044.
22. Venuthurupalli SK, Rolfe A, Cameron (Salisbury) A, Wang Z, Hoy WE. *CKD.QLD: Management of Chronic Kidney Disease through Tele-Health in Queensland, Australia*. Publication only: PUB164.
23. Wang Z, Zhang J, Healy HG, Tan K-S, Venuthurupalli SK, Cameron (Salisbury) A, Hoy WE. *Application of Urinary Albumin: Creatinine Ratio to Predict Renal Replacement Therapy and All-Cause Mortality in a CKD Cohort*. Publication only: PUB198.
24. Abeysekera RA, Wang Z, Zhang J, Healy HG, Cameron (Salisbury) A, Hoy WE. *Comparison of Different Definitions of Progression of Chronic Kidney Disease and Predisposing Factors in a Public Renal Practice: Queensland, Australia*. Publication only: PUB209.

Australian and New Zealand Society of Nephrology [APCN/ANZSN ASM]; September 2016

25. Rawlings C, Cameron A, Wang Z, Healy H, Hoy WE. *Comparing those with CKD planned for renal supportive care and those for renal replacement therapy.* Poster (069).
26. Rawlings C, Cameron A, Wang Z, Mallett A, Healy HG, Hoy WE. *Timing of renal supportive care decisions in advanced chronic kidney disease: effect on hospitalisations and place of death*. Poster (070).
27. Wilson GJ, Mallett A, Kark A, Tan K-S, Cameron A, Wang Z, Healy HG, Hoy WE. *The association between cancer and acute tubular necrosis in patients with chronic kidney disease*. Poster (113).
28. Wilson GJ, Mallett A, Kark A, Tan K-S, Cameron A, Wang Z, Healy HG, Hoy WE. *The prevalence and characteristics of acute interstitial nephritis and pyelonephritis in patients with chronic kidney disease.* Poster (115).
29. Hoy WE, Healy HG, Bonner JA, Mitchell G, Connelly L, Panaretto K. Endre Z, Coombes JS, Bobe G, Fassett RG, Cameron A. *The NHMRC Chronic kidney disease centre of research excellence (CKD.CRE) - 2015-2019: the first year*. Poster (133).
30. Gobe GC, Endre ZH, Coombes JS, Healy HG, Wilkinson R, Tan KS, Cameron A, Hoy WE. *Quality biobanking of chronic kidney disease specimens.* Poster (141).
31. Zhang J, Wang Z, Healy H, Venuthurupalli S, Tan K, Fassett R, Cameron A, Hoy W. *The first comprehensive overview of patients with chronic kidney disease, and their outcomes, in the CKD.QLD registry; Queensland, Australia (2011-2015)*. Poster (142).
32. Wang Z, Zhang J, Healy HG, Tan KS, Venuthurupalli SK, Cameron A, Hoy WE. *Characteristics of CKD.QLD patients by index of relative socio-economic disadvantage (IRSD).* Poster (143).
33. Wang Z, Zhang J, Healy HG, Tan KS, Venuthurupalli SK, Cameron A, Hoy WE. *Risk factors of starting renal replacement therapy and mortality in CKD.QLD patients.* Poster (144).
34. Ismail I, Venuthurupalli SK, Cameron A, Hoy WE. *CKD.QLD: effect of bariatric procedures on renal and non-renal parameters in obese CKD patients.* Poster (146).
35. Venuthurupalli SK, Rolfe A, Skewes J, Fanning J, Cameron A, Hoy WE. *CKD.QLD: if the mountain doesn't come to you… you go to the mountain: improving CKD outcomes in Aboriginal population.* Poster (147).
36. Abeysekera R, Wang Z, Cameron A, Healy H, Hoy W. *Factors associated with chronic kidney disease progression, by different definitions, in patients in a Queensland metropolitan public renal service*. Poster (148)
37. Abeysekera R, Wang Z, Cameron A, Healy H, Hoy W. *Factors associated with chronic kidney disease progression, by different definitions, in patients in a Queensland metropolitan public renal practice.* Poster (150).
38. Ranganathan D, Jegatheesan D, Hoy W. *Queensland glomerulonephritis registry.* Poster (214).

European Renal Association/European Dialysis and Transplant Association [ERA/EDTA]; September 2016

39. Coleman S, Havas K, Ersham S, Stone C, Taylor B, Graham A, Bublitz L, Purtell L, and Bonner A. *Patient Satisfaction with Nurse-Led Chronic Kidney Disease Clinics: A Multi-site Quality Improvement Study.*

Renal Society of Australasia [RSA]; June 2016

40. Nguyen TN, Douglas C, Bonner A. *Chronic Kidney Disease Self-Management: A Validation Study in Vietnamese Language*.
41. Nguyen TN, Douglas C, Bonner A. *Kidney Knowledge Survey: A Validation Study in Vietnamese Language.*

42. Chambers S, Bonner A, Chhabra S, Healy H, Yates P, Hoy WE, Mitchell G. *A feasibility study to track the last 12 months of life in chronic kidney disease patients: baseline characteristics.* Poster (Top 10) and Short Oral.
43. Rolfe A, Venuthurupalli S, Hoy WE, Wang Z, Cameron A. *An innovative model of improving access to renal specialist care: One rural centre's experience with a nurse practitioner (NP) led chronic kidney disease (CKD) tele-health service.* Oral Presentation.

Royal Darwin Hospital Grand Rounds; August 2016

44. Invited Speaker Hoy WE. *The Developing Landscape of Chronic Kidney Disease (CKD).*

Fetal and Neonatal Physiological Society Annual Meeting; Sept 2016

45. Black MJ, Davison B, Chatfield M, Ryan D, Sutherland MR, Diwakarla S, Hoy WE, Singh G. *Renal function in the first month of life in Australian Indigenous and non-Indigenous preterm neonates*. Poster (19). Cambridge, UK.

2017

Kidney Health Australia Think Tank; March 2017

46. Invited attendee, Hoy WE. Kidney Health Australia (KHA) Think Tank. Darwin.

BEAT-CKD Registries Symposium; April 2017

47. Invited speaker, Hoy WE. *The CKD.QLD Registry and Research Platform*. (Better evidence and translation in chronic kidney disease). ANZDATA. South Australian Health and medical Research Institute (SAHMRI), Adelaide.

International Society of Nephrology, World Congress of Nephrology: April 2017

48. Invited Attendee, Hoy WE. ISN WCN CKHDP Business Meeting. (Committee for Kidney Health in Disadvantaged Populations), Mexico City, Mexico.
49. Invited Attendee, Hoy WE. INet-CKD Meeting. (International Network of Chronic Kidney Disease), Mexico City, Mexico.
50. Attendee, Hoy WE. 11th Conference on Kidney Disease in Disadvantaged Populations (A satellite meeting of the World Congress of Nephrology 2017) (ISN WCN), Santiago de Queretaro, Mexico.
51. Invited Co-Chair, Hoy WE. Session VI: Unique approaches to Kidney Disease in Developing Countries, 11th Conference on Kidney Disease in Disadvantaged Populations. International Society of Nephrology, World Congress of Nephrology Conference (ISN WCN), Santiago de Querétaro, Mexico.

Renal Society of Australasia Annual Conference: June 2017

52. Bonner A, Chambers S, Healy H, Hoy WE, Mitchell G, Kark A, Ratanjee S, Yates P. *Tracking symptom experience and physical functioning in the last 12 months of life in advanced chronic kidney disease*. Oral.
53. Bonner A, Hoy WE, Healy HG, Mitchell G, Gobe G, Coombes JS, Endre Z, Panaretto K, Connelly L, Fassett RG. *An overview and progress report of a multidisciplinary chronic kidney disease centre of research excellence*. Oral.
54. Purtell L, Bonner A, Healy H, Berquier I, Douglas, C, Hoy WE. *Baseline chaacteristics of patients in a single-site kidney supportive care program*. Oral.

Australian and New Zealand Society of Nephrology [ANZSN]; September 2017, Darwin

55. Venuthurupalli S, Hoy WE, Healy H, Wang Z, Cameron A, Fassett R. *CKD.QLD: Relationship between smoking and Chronic Kidney Disease (CKD) in the Darling Downs Region, Queensland*. Poster.
56. Sowa PM, Hoy WE, Zhang J, Cameron A, Connelly, LB. *Chronic Kidney Disease (CKD) and health care utilisation: Insights from health data linkage in Queensland*. Poster.
57. Purtell L, Berquier I, Douglas C, Taylor B, Kramer K, Heffernan D, Hoy WE, Bonner A, Healy H. *What a patient wants: A consumer perspective of kidney supportive care*. Mini oral.
58. Wang Z, Zhang J, Adegbija O, Abeysekera R, Healy HG, Tan KS, Cameron A, Hoy WE. *Progression of kidney disease in a cohort of chronic kidney disease (CKD) patients*. Mini oral session
59. Owens EP, Hoy WE, Coombes JS, Endre ZH, Gobe G. *The distinguishing risk of progressive chronic kidney disease (DROP CKD) Study.* Poster.

60. Owens EP, Hoy WE, Coombes JS, Gobe G. *Establishing a chronic kidney disease biobank in Queensland to support future research*. Poster.
61. Chan S, Cameron A, Wang Z, Venuthurupalli SK, Tan K, Healy HG, Hoy WE. *Evaluating associations of body mass index (BMI) in chronic kidney disease patients (CKD) in the CKD.QLD registry; Queensland, Australia.* Poster.
62. Tan KS, Ng S, Zhang J, Wang Z, Cameron, A, Hoy WE. *Characteristics, mortality and renal outcomes of patients with diabetes and CKD who have undergone renal biopsy*. Poster.
63. Tan KS, Ng S, Zhang J, Wang Z, Cameron, A, Hoy WE. *The first cardiovascular event post enrolment in CKD.QLD registry patients with diabetes who have undergone renal biopsy*. Poster.
64. Wilson GJ, Mallett A, Kark A, Tan AK, Cameron A, Wang Z, Healy HG, Hoy WE. *Rates and characteristics of acute kidney injury (AKI) in the chronic kidney disease in Queensland (CKD.QLD) Registry.* Poster.
65. Adegbija O, Cameron A, Hoffman D, Segelov D, Waugh D, Huynh S, Hoy WE. *An extraction tool for chronic kidney disease data from Audit4.* Mini oral.
66. Zhang J, Wang Z, Adegbija O, Abeysekera R, Healy HG, Tan KS, Venuturupalli SK, Cameron A, Hoy WE. *Blood pressure management in hypertensive patients with non-dialysis chronic kidney disease in Queensland, Australia.* Mini oral.
67. Wilson GJ, Kark A, Francis L, Hoy WE, Healy HG, Mallett A. *Acute Interstitial Nephritis (AIN) in Australia: A single centre case series.* Poster.

EDTNA/ERCA Conference; September 2017, Krakow, Poland.

68. Chambers S, Bonner A, Healy H, Hoy WE, Mitchell G, Kark A, Ratanjee S, Yates P. *Renal patients' symptom experience and quality of life in their last year of life.* Poster/short oral.
69. Bonner A, Purtell L, Healy H, Berquier I, Douglas C, Hoy WE. *Integrating renal and palliative care to support patients nearing end of life.* Oral (81).
70. Bonner A, Purtell L, Healy H, Berquier I, Douglas C, Chaplin B, Hoy WE. *Examining stakeholders' perspectives of the implementation of an integrated kidney supportive care program*. Poster.

Australian Palliative Care Conference, September 2017, Adelaide South Australia

71. Chambers S, Bonner A, Healy H, Hoy WE, Kark A, Ratanjee S, Mitchell G, Douglas C, Yates P. *Tracking health service utilisation of patients with advanced kidney disease: Informing future health service direction and development.* Oral

American Society of Nephrology (ASN) Kidney Week, November 2017, New Orleans, LA, USA

72. Chan S, Cameron A, Wang Z, Healy HG, Hoy WE. *The association of body mass index (BMI) with mortality and institution of renal replacement therapy (RRT) in (CKD) patients in the CKD.QD registry; Qld, Australia*. Poster.
73. Orlandi PF, Fukagawa M, Fujii N, Djurdjev O, Rios P, Yang W, Hoy WE, Feldman H, Shardlow A, Levin A, Ahn C, Healy HG, Oh K, Sola L, Nessel L, Taal M. *Global variation in rates of ESRD and death among the ISN's International Network of CKD Cohort Studies (Inet-CKD).* Poster.
74. de Pinho NA, Oh K, Sola L, Mayer GJ, De Borst MH, Taal M, Stengel B, Levin A, Fukagawa M, Hoy WE, Robinson BM, Feldman HI, Zhang L, Eckardt K, Jha V. *Global variation in blood pressure control and anti-hypertensive therapy in CKD patients with hypertension*. Poster.
75. Tan K, Ng S, McDonald S, Hoy WE. *Competing risk of RRT and death in patients with diabetes and CKD who have undergone renal biopsy.* Publication only.

2018

Queensland Epidemiology Group, August 2018. Brisbane.

76. Invited Speaker, Hoy WE. *Kidney disease among Aboriginal and Torres Strait Islander people in Australia. The role of epidemiology in addressing health disadvantage and improving health outcomes of Indigenous Australians.*

Human Genetics Society of Australasia (AGSA) ASM; August 2018. Sydney

77. Mallett A, Sowa M, Wardrop L, Zhang J, Cameron A, Healy H, Hoy WE and on behalf of the CKD.QLD consortium. *Chronic Kidney Disease patients with Inheritable Kidney Disease have higher associated healthcare costs.* Poster.

Australian Diabetes Congress; August 2018

78. *High baseline levels of high-sensitivity troponin T are associated with renal function decline in Indigenous Australians with diabetes: the Egfr follow up study.* Poster presentation.

Human Genetics Society of Australia [HGSA], 42nd Annual Scientific Meeting; August 2018

79. Mallett A. *Chronic Kidney Disease patients with Autosomal Dominant Polycystic Kidney Disease or other Inheritable Kidney Disease have distinct characteristics and higher associated healthcare costs.* Oral presentation.

Primary Health Care Research Conference; August 2018

80. Mitchell G, Zhang J, Hoy WE. *Are general practitioners adhering to Chronic Kidney disease guidelines? If not, why?* Oral.

CheckUP Forum, Brisbane; September 2018

81. Yates C, Johnson T, Chua D. *Beacon programs at Inala Primary Care. Illuminating complex care in a community setting. Poster*

Australian and New Zealand Society of Nephrology ASM; September 2018, Sydney

82. Jeyaruban A, Hoy WE, Cameron A, Healy H, Zhang J, Mallett A. *Assessing the impact of hyperuricaemia, gout and allopurinol treatment on progression of renal function in patients with chronic kidney disease.* Mini oral.

83. Jeyaruban A, Hoy WE, Cameron A, Healy H, Zhang J, Mallett A. *Cardiovascular events do not accelerate decline of renal function in patients with chronic kidney disease.* Mini oral.

84. Jeyaruban A, Hoy WE, Cameron A, Healy H, Zhang J, Mallett A. *Factors that influence hospitalisations in patients with chronic kidney disease.* Mini oral

85. Jeyaruban A, Hoy WE, Cameron A, Healy, H, Zhang, J, Mallett A. *Cardiovascular events increase the risk of mortality in patients with chronic kidney disease.* Mini oral.

86. Jeyaruban A, Hoy WE, Cameron A, Healy H, Zhang J, Mallett A. *Does the type of intervention for ischaemic heart disease impact on mortality and morbidity in patients with chronic kidney disease?* Mini oral.

87. Sowa M, Zhang J, Cameron A, Healy HG, Hoy WE, Connelly LB on behalf of the CKD.QLD registry consortium. *Chronic kidney disease: who are the high cost users of hospital care?* Mini oral.

88. Adegbija O, Cameron A, Hoffman D, Segelov D, Freeman T, Waugh D, Huynh S, Hoy WE (Healy HG on behalf of WE Hoy). *Profile of patients in a renal specialty practice in metropolitan Sydney, utilizing Audit4: are they different?* Mini oral.

89. Adegbija O, Hoy WE (Healy HG on behalf of WE Hoy), Wang Z, Cameron A, Healy HG, Tan KS, Venuthurupalli SK. *Chronic kidney disease is not characterized solely by those starting renal replacement therapy.* Mini oral.

90. Hoy WE, Zhang J, Wang Z, Cameron A, Healy HG, Venuthurupalli S, Tan K, Govindarajulu S, Rolfe A, Mahtha M, Titus T, Cherian Roy, Wu P, Banney C, Mutatiri C, Madhan K, Ranganathan D, Kan G, Han T, Hossain S, Kark A, Cleman S, Taylor B, Mallett A and on behalf of the NHMRC CKD.CRE and the CKD.QLD Collaborative. *The end of the CKD journey – RRT or death without RRT: The CKD.QLD experience.*

91. Zhang J, Hoy WE, Baboolal K, Wang Z, Cameron A, Healy HG, Venuthurupalli S, Tan K-S, Govindarajulu S, Rolfe A, Mantha M, Titus T, Cherian R, Wu P-C, Banney C, Mutatiri C, Madhan K, Ranganathan D, Kan G, Han T, Hossain S, Kark A, Coleman S, Taylor B and Mallett AJ. *AKI in patients with chronic kidney disease in public nephrology practices in Queensland.* Mini oral.

92. Venuthurupalli S, Gupta A, Lee A, Mahmood U, Govindarajulu S, Healy HG, Fasset R, Cameron A and Hoy WE. *CKD.QLD: profile and long-term outcomes of Aboriginal & Torres Strait Islander (A&TSI) people with chronic kidney disease from Darling Downs, Queensland.* Mini Oral.

93. Wilkinson S, Venuthurupalli S, Cameron A, Healy HG, Fassett R, Hoy WE. *CKD.QLD: Association of monoclonal gammopathies and chronic kidney disease.* Oral presentation.

94. Tan K-S, McDonald S, Hoy WE. *Characteristics, mortality and renal outcomes of Pacific Islander and Maori patients with diabetes and CKD who receive specialist nephrology care.* Poster.

95. Tan K-S, McDonald S, Hoy WE. *Characteristics, mortality and renal outcomes of ATSI patients with diabetes and CKD who receive specialist nephrology care.* Mini oral.

96. Mallett A, Sowa P, Wardrop L, Zhang J, Cameron A, Hoy WE. *CKD patients with autosomal dominant polycystic kidney disease or other inheritable kidney disease have distinct characteristics and higher associated healthcare.* Poster.

American Society of Nephrology (ASN) Kidney Week, October 2018, San Diego, CA, USA

97. Mallett A, Sowa M, Wardrop L, Zhang J, Cameron A, Healy H, Hoy WE and on behalf of the CKD.QLD consortium. *Chronic Kidney Disease patients with Autosomal Dominant Polycystic Kidney Disease or other Inheritable Kidney Disease have distinct characteristics and higher associated healthcare costs.* Publication only.

98. Hoy WE, Zhang J, Healy HG, Wang Z, Venuthurpalli SK, Mallett AJ, Cameron A on behalf of the NHMRC CKD.CRE and CKD.QLD Collaborative. *Frequency and consequences of acute kidney injury in patients with chronic kidney disease in public nephrology practices in Queensland, Australia.* Poster.

99. Jeyaruban AS, Mallett AJ, Cameron A, Zhang J, Healy HG and Hoy WE obot NHMRC CKD.CRE and CKD.QLD Collaborative. *Impact of cardiovascular events on mortality and decline of renal function in patients with chronic kidney disease.* Poster.

100. Hoy WE, Zhang J, Wang, Z, Cameron A, Healy HG, Mallett A, Venuthurupalli S. *The end of the CKD journey – who starts renal replacement therapy and who dies without it among CKD patients in public renal speciality practices in Qld, Australia.* Poster

(Qld) Statewide Renal Network Forum; November 2018

101. Invited Speaker, Hoy WE. *The end of the CKD Journey – RRT or death without RRT: The CKD QLD experience.* State Library of Queensland, South Brisbane

2019

International Society of Nephrology World Congress of Nephrology; April 2019

102. Purtell L. Bonner, A., Berquier, I., Douglas, C., & Healy, H. *Longitudinal evaluation of patients with advanced stages of chronic kidney disease attending a multidisciplinary kidney supportive care clinic*.

103. Purtell, L., Bonner, A., Berquier, I., Douglas, C., & Healy, H. (2019). *Supportive care for Aboriginal and Torres Strait Islander people with advanced CKD in an urban setting.* Poster presented at the International Society of Nephrology World Congress of Nephrology 2019, 12-15 April, Melbourne, Australia.

104. Rice, M., Scuderi, C., Berquier, I., Douglas, C., Purtell, L., Bonner, A., &. Healy, H. (2019). *The role of the pharmacist in kidney supportive care – a case example.* Poster presented at the International Society of Nephrology World Congress of Nephrology 2019, 12-15 April, Melbourne, Australia.

105. Sowa PM, Purtell P, Hoy WE, Healy HG, Bonner A, Connelly LB. *Kidney supportive care: health service utilisation outcomes from a program implementation in Brisbane, Australia.*

106. Owens EP, Healy H, Tan K, Venuthurupalli SK, Ellis R, Cameron A, Gobe GC, Hoy WE. *Geographical distribution of "uncertain" renal disease diagnoses in renal speciality practices of south-east Queensland and Darling Downs, Australia.*

107. Hoy WE. *The CKD.QLD registry: characteristics & course of chronic kidney disease patients in public nephrology care in Queensland, Australia.*

108. Hoy WE, Zhang J, Wang Z, Healy H, Venuthurupalli SK, Fassett R, Tan KS, Cherian R, Cameron A, O.B.O.T. CKD.QLD Collaborative. *The end of the CKD journey - renal replacement therapy (RRT) or death without RRT: the CKD.QLD experience.*

109. Hoy WE, Zhang J, Wang, Z, Cameron A, Healy HG, Venuthurupalli S. Fassett R, Tan KS, Cherian R, Cameron A, OBOY CKD.QLD Collaborative. *The end of the CKD journey – who starts renal replacement therapy and who dies without it among CKD patients in public renal speciality practices in Queensland, Australia.* Poster presentation.

110. Hoy, WE , Zhang J , Wang Z, Healy HG, Venuthurupalli SK, Fassett RG, Tan KS, Cherian, R, Cameron A, OBOT CKD.QLD Collaborative. *The CKD.QLD Registry: characteristics and course of chronic kidney disease (CKD) patients in public nephrology care in Queensland, Australia.*

111. Tan K, McDonald S, Hoy WE. Are Indigenous Australians with diabetes and kidney disease receiving specialist renal care at greater risk of end stage kidney failure than their non-indigenous counterparts? Poster presentation.

2020

RMIT Engineering Capstone Project

112. Project team: Campbell A, Dimaano A, Hansen C. Project Supervisor: Currell M. *Securing Safe Supplies for Remote Communities in Western Australia.* Optimus Group, RMIT University, The University of Queensland.

Australian and New Zealand Society of Nephrology Annual Scientific Meeting; Nov 2020

113. Zhang J, Diwan V, Wang Z, Venuthurupalli S, Healy HG, Hoy WE. *Management of anaemia in chronic kidney disease patients in two Queensland health renal specialty sites – a CKD.QLD registry study.* ePoster presentation.

114. Zhang J, Diwan V, Wang Z, Venuthurupalli S, Healy HG, Hoy WE. *The impact of anaemia on outcomes and costs in patients with chronic kidney disease in two public nephrology practices in Queensland: a CKD.QLD registry study.* ePoster

115. Hoy WE, Jadhao S, Thomson R, Mathews J, Foote S, Savige J, McMorran B, Nagaraj SH. *Whole genome analysis of Indigenous Australians reveals variants associated with chronic kidney disease*. ePoster

116. Owens EP, Hoy WE, Tan KS, Lennan E, Cameron A, Humphries TLR, Ellis RJ, Healy HG, Gobe GC. *Biomarkers that predict progression of chronic kidney disease more accurately than established clinical parameters.* Mini oral presentation.

117. Khan MA, Nag P, GiulianI KTK, Wang X, Grivei A, Hoy WE, Healy HG, Diwan V, Gobe GC, Kassianos AJ. *Induction of ferroptotic death in human primary proximal tubular epithelial cells (PTEC) during adenine-induced chronic kidney disease.* ePoster.

118. Diwan V, Niogret S, Zhang J, Wang Z, Healy HG, Mitchell G, Hoy WE obot CKD.QLD Collaborative. *Burden of cardiovascular disease and impact on hospital admissions, costs and death among pre-terminal chronic kidney disease patients*. Mini oral.

119. Kearey P, Mallett A, Cameron A , Healey H , Denaro C, Thomas M, Lee V, Fuller M , Hoy W. *Ckd.Qld fabRy Epidemiology (aCQuiRE) Study: Implementation of a pragmatic Fabry Screening Study for CKD Patients.* ePoster.

120. Shankar AJ, Hoy WE, McMorran B, Scaria V, Foote S, Nagaraj SH. *Pharmacogenomics for chronic disease medicines in an Australian Indigenous population.* Mini oral.

121. Wang Z, Zhang J, Diwan V, Venuthurupalli S, Healy HG, and Hoy WE and the CKD.QLD consortium. *An overview of patient characteristics and outcomes in the CKD.QLD registry, Australia, 2011 to 2018*. Mini oral.

122. Mallett A, Kearey P, Cameron A, Healey HG, Denaro C, Thomas M, Lee V, Fuller M, Hoy WE. *Fabry Epidemiology (ACQUIRE) STUDY: Fabry Disease prevalence amongst patients with Chronic Kidney Disease*. ePoster.

123. Tan KS, McDonald S, Zhang J, Wang Z, Hoy WE and the CKD.QLD consortium. *Morbidity of patients with diabetes and CKD who receive specialist renal care – hospital admission frequency and bed day usage.* ePoster.

124. Tan KS, McDonald S, Zhang J, Wang Z, Hoy WE and the CKD.QLD consortium. *Morbidity of patients with diabetes and CKD who receive specialist renal care – causes of hospital admission*. ePoster

125. Tan KS, McDonald S, Hoy WE and the CKD.QLD consortium. *What is the relationship between cardiovascular morbidity, death and ESKF in patients with diabetes and CKD who receive specialist renal care?* Mini oral.

American Society of Nephrology (ASN) Kidney Week (virtual), October 2020, Denver, Colorado, USA

126. Tan KS, McDonald SP on behalf of CKD.QLD consortium. *The relationship of cardiovascular morbidity with death and ESKF in patients with Diabetes and CKD receiving specialist renal care.* ePoster presentation.

127. Mallett AJ, Kearey PJ, Cameron A , Healey HG , Denaro CP, Thomas M AB, Lee V WS, Fuller M , Hoy WE. Ckd.Qld fabRy Epidemiology (aCQuiRE) Study: Fabry Disease Prevalence among Patients with CKD. ePoster presentation.

Symposium Series on Computational Intelligence; (virtual) December 2020

128. Im Sea Jung, Xu Y, Watson J, Bonner A, Healey HG, Hoy WE. *Hospital readmission prediction using discriminative patterns.* Oral 314. AusDM'20, in Big Data Analytics SS-0314. 2020 IEEE Symposium Series on Computational Intelligence.