



Chronic Disease
Innovation Centre



2018 Annual Report



Our vision

To change the way healthcare is delivered –
by leading the personalization of our health systems
to be more responsive to patients and deliver better value

Message from our Board Chair and CEO

We are pleased to present the first Annual Report of the Seven Oaks Chronic Disease Innovation Centre.

In this report, you will learn about the amazing researchers at CDIC who are doing remarkable work to better the lives of Manitobans and indeed, people throughout the world.

Chronic disease prevention and management is a key public healthcare challenge, and innovation is a necessity, given limited resources and vulnerable populations. The improved ability to prevent or delay the onset of disease requiring medical intervention and in-patient care is one of our primary goals at CDIC. If and when care is required, we know that the ability to manage that care in the patient's own home and community for as long as possible leads to better outcomes for the patient and their family so effective, compassionate and efficient disease management is another fundamental objective of CDIC. The great news is that significant progress is being made in both of these areas.

The Chronic Disease Innovation Centre had its origins in the forward-looking approach to health taken by Seven Oaks General Hospital and its Foundation when the Wellness Institute was built in the 1990s. Like the Wellness Institute, the Chronic Disease Innovation Centre is defined by its commitment to innovation and excellence in research and care. The collaboration and support between the Chronic Disease Innovation Centre, the Wellness Institute and Seven Oaks General Hospital truly make the whole greater than the sum of the individual parts – for the benefit of all.

We cannot express sufficient thanks to the talented and hard-working staff of CDIC for the incredible work that they do, the care they provide, and for choosing CDIC as the facility that can provide them with the best support and environment to help them achieve their professional aspirations.

A special thank you is owed to the donors who provide financial resources for the vital work of CDIC. We are also very appreciative of the volunteers who so generously provide their time and expertise.

We hope that you are both informed and inspired by this report.

Respectfully submitted on behalf of the Board of Directors,



Don MacDonald
Board Chair
Chronic Disease Innovation Centre



Carrie Solmundson
Chief Executive Officer
Chronic Disease Innovation Centre

Working to improve people's lives

We are passionate about improving people's lives through the prevention and management of chronic disease.

At a time when healthcare systems are coping with shifting demographics, increasing incidence of chronic disease, and rising health care costs, our new approaches and technologies are improving the quality of patient care, helping to prevent disease, and promoting wellness.

We foster innovation and collaboration to:

- Improve the health, healthcare and well-being of our patients
- Spur innovation that reduces healthcare costs
- Bring new healthcare products and technologies to market
- Provide local, national, and international reach
- Unite experts from the healthcare, research, academic, medical device, and business sectors

INNOVATION DOESN'T JUST HAPPEN – ORGANIZATIONS HAVE TO PURSUE IT. INNOVATION REQUIRES VISION, LEADERSHIP, AND THE WILLINGNESS TO EMBRACE NEW IDEAS.



A unique model that leads to ground-breaking solutions

The CDIC model – unique in the province – puts powerful prevention-focused research into action to create life-changing solutions for Manitobans and people around the world.

Our activities are integrated with the operation of Seven Oaks General Hospital and the hospital's Wellness Institute. As such, we are part of a unique community and specialty hospital with a remarkable emphasis on treatment, management, and prevention of chronic disease.

This ideal environment allows us to apply research directly to improve care within the hospital: our researchers are also clinicians, so our hospital patients see the benefits of research applied immediately – improving their experience and reducing healthcare costs.

We are also a player in improving healthcare processes, helping family physicians in their daily assessment of patients, and supporting better health policy and decision-making by governments.

Academic and research excellence: the University of Manitoba connection

- Our principal investigators are Associate and Assistant Professors at the University of Manitoba, in the Rady Faculty of Health Sciences, Max Rady College of Medicine.
- Medical students and Masters of Science students from the U of M participate directly in our ongoing research. They gain insights into how research is conducted and gain valuable transferable skills for their future careers.
- The CDIC's academic research funding is secured through U of M-based grants, with multi-year programs in place.



The CDIC is an independent, non-profit organization governed by a volunteer board appointed by the Seven Oaks General Hospital Foundation.

Our collaborators and funding partners



SEVEN OAKS
GENERAL HOSPITAL



CIHR IRSC



Research
Manitoba



kidneyhealth.ca
manitoba renal program



Can-SOLVE
CKD Network

Strategy for Patient-Oriented Research

SPOR

World-leading research across a broad spectrum

Our researchers are receiving global recognition for their original and applied research in key areas that generate real benefits for patients and healthcare systems.

Risk predictive analysis

In healthcare, risk predictive analysis uses unique patient characteristics to calculate a probability of experiencing a health-related condition in a defined time period.

Risk predictive analysis can be used to inform the personalized care for patients, align risks with resources, and present risk to patients in a way they can understand. For example, our CDIC principal investigators use the Kidney Failure Risk Equation in their clinical work with late-stage kidney disease patients to present the probability of their need for dialysis in two or five years.



Epidemiology (public health)

Epidemiology refers to the causes, effects and patterns of diseases and other health-related conditions in a defined population. The CDIC team strives to collaborate with public health teams in the province to build a better surveillance system, so we can track such epidemiological trends in real time.

Common statistics used in epidemiology are the *prevalence* (percentage of a population with a health-related condition), the *incidence* (rate of change of a health-related condition in a population) and the *relative risk* (the magnitude of association between a health-related condition and a risk factor).

Kidney health

CDIC researchers are focused on the entire spectrum of kidney disease, from prevention through to end-stage treatment. Research areas include pharmacoepidemiology – the safety, efficacy and best utilization of medication; CKD epidemiology – optimal strategies to find and treat kidney disease; lifestyle factors – the effects of exercise and nutrition on chronic kidney disease; and home dialysis use and policy.

Healthcare economics

Working with healthcare providers, using available data, and synthesizing medical literature, the CDIC team aims to provide expert guidance on the value and effectiveness of healthcare interventions.

This includes comparing new interventions with current practices and providing assessments of the budget impact from major health policy decisions.

Process engineering

Process engineering evaluates the delivery mechanisms involved in the healthcare system and provide suggestions for improvement.

The CDIC team can use simulation models to evaluate things like clinical workflow to predict downtimes, bottlenecks and high-work volume periods. This can allow for process improvement to enhance patient care, and reduce wait times and system costs.



Continuing a tradition of innovation excellence

Chronic disease innovation has long been a strategic priority at Seven Oaks General Hospital.

More than 20 years ago, Seven Oaks recognized the need to invest in prevention, and so created the Wellness Institute – the first of its kind in Canada – to help patients manage chronic diseases such as diabetes, and heart, lung and kidney disease with exercise, diet, and healthy lifestyle choices. The Wellness Institute has successfully worked to improve population health and reduce the demand on hospital resources.

Since then, Seven Oaks has become Western Canada's largest kidney health centre, an effective provider of medical services to Manitoba's capital region, and an innovator in connecting acute care with community care.

With the addition of the CDIC to the hospital campus in 2015, Seven Oaks is attracting world-class researchers to its growing community of innovation, making measurable progress in the battle against chronic disease, and demonstrating the way to change healthcare delivery everywhere.

We are proud of our ongoing work that benefits patients and health systems, at home and around the world.

Improving the patient journey

Screening

Early and accurate detection of at-risk individuals

Patient benefit

Prevent, delay, and minimize severity of disease

Health system benefit

Ease of administration and high reliability leads to cost saving throughout the system

Triage

Determining optimal personalized treatment pathway

Patient benefit

Rapid access to the most appropriate specialists, care and resources

Health system benefit

Improved efficiency, optimization of resources and reduced backlog

Treatment

Providing advanced and improved care to patients

Patient benefit

Improved patient outcomes, experience, and quality of life

Health system benefit

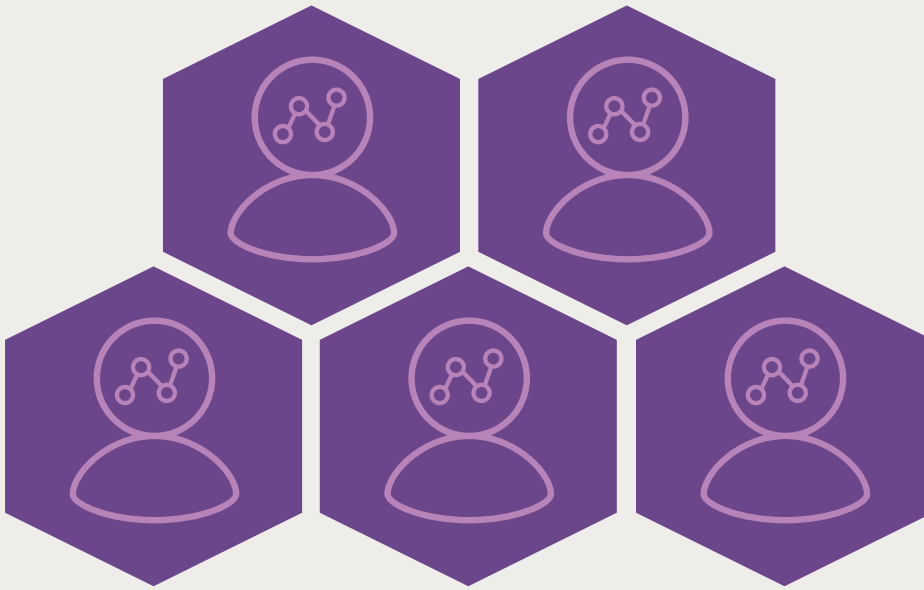
Dramatically reduce costs, optimize resources, and improve outcomes



CDIC IS ACHIEVING RESULTS
THAT BENEFIT PATIENTS AND
HEALTH SYSTEMS, AT HOME
AND AROUND THE WORLD.

Highlights

5 principal researchers



8 supporting team members



16 students engaged in research activities



18 research articles published



3 clinical trials



>\$2.5 MILLION
in ongoing university-held grants

600 participants in CanFIT¹ (since 2012)



11 Manitoba communities screened for kidney disease to date

>700,000 patient records from 30 countries – to verify the KFRE

12 database studies for Manitoba Centre for Health Policy



3 Can-SOLVE projects with 23 patient partners



2 public events promoting healthy living



17 presentations at medical conferences



MULTIPLE international partnerships



ONE GLOBAL STANDARD
to predict kidney failure: KFRE

¹CanFIT = Canadian Frailty Observation and Interventions Trial.



An innovation hub with local and global impact

The Chronic Disease Innovation Centre is led by a core group of principal investigators who possess an impressive array of medical, research, data analytics, and health economics knowledge and skills. Working across a broad spectrum with their teams of scientists and technicians, they are helping to change the way healthcare is delivered.

While each project has a primary investigator, all projects benefit from input from all members of the team. This truly collaborative approach strengthens the overall methodology and final product.

Here are the stories that shaped our year

A welcoming space for research and collaboration

In 2018 the CDIC research team found their home when a former auditorium at Seven Oaks General Hospital was transformed into a contemporary, inviting research space.

The new space provides a collaborative environment that has quickly become the focal point for the team's interdisciplinary research into the prevention, early identification, and treatment of chronic disease – including kidney disease, diabetes, and hypertension.

The centre became a reality thanks to a successful multi-year capital campaign run by the Seven Oaks General Hospital Foundation.

Collaborating with a world health leader to help physicians care for patients

The Kidney Failure Risk Equation study, led by Seven Oaks researchers, was a breakthrough research approach that has led to the development of a simple and reliable tool to accurately predict which patients are at risk of kidney failure. The algorithm, published in the *Journal of the American Medical Association* in 2011, used several thousand Canadian patient health records and eight common lab tests to predict a two- and five-year risk of kidney failure.

A further study by the CDIC team and other international researchers – using 700,000 patient records from 30 countries – has simplified the equation and confirmed that it applies to kidney patients globally. The equation is now a global standard for predicting kidney failure, and researchers are applying the same process to create better risk equations for other diseases.

In 2018, CDIC's ongoing collaboration with the Mayo Clinic moved forward with a project to integrate the Kidney Failure Risk Equation in electronic decision aids for physicians to discuss risk with kidney disease patients so they can make informed decisions about their course of treatment.

Advancing the prediction of kidney failure in children

In 2018, the Kidney Risk Failure Equation (KRFE) – originally developed by Seven Oaks researchers for use with adults – was found to also accurately predict kidney failure in children who have chronic kidney disease. Researchers at the University of California, San Francisco, studied 603 children and found that the KRFE score predicted the progression to end-stage renal disease in children at 1, 2, and 5 years. Previously there had been no equation used to estimate the timing of kidney failure in children.

This important finding means that the KRFE now also has the potential to improve the care for children with advanced kidney disease – by providing knowledge that can identify those who would benefit most from intensified treatment, while sparing children who will remain stable for longer periods.

Mentoring the researchers of the future

In 2018, medical, undergraduate and Masters of Science students continued to play a key part in supporting research at CDIC.

Working with our principal investigators, they participate directly in public health, economic and data analysis studies. They also attend rounds in the hospital, seeing patients with our researcher-clinicians. As they observe, learn and contribute, they learn how to apply research principles and gain a number of transferable skills that can help them in their future careers.

For medical students, this exposure also helps them to understand the important role of research, and what it can mean for their future patients.

In 2018, former CDIC student Alain Beaudry, who is pursuing a medical degree, won the University of Manitoba's 2018 Dr. John Embil Publication Prize for co-authoring the article *Cost of Dialysis Therapy by Modality in Manitoba*.

Working to improve the health of Canada's Indigenous peoples

At a time when this country's chronic disease rates are on the rise, Manitoba has the highest rate of kidney failure in the country. Chronic kidney disease (CKD) affects 11% of Canadian adults; in Manitoba, that number is 15%. Indigenous peoples are at higher risk for kidney disease than other Canadians. In some of the province's northern communities, the rate of CKD is as high as 28%.

Between 2012 and 2015, CDIC researchers collaborated with Indigenous partners at the Diabetes Integration Project and the Manitoba Renal Program to conduct community-wide screening in 11 Manitoba communities for chronic kidney disease, diabetes and hypertension.

This ground-breaking work helped to identify which patients living with CKD were at risk of kidney failure. As a result, high-risk Indigenous patients are now more likely to see a specialist early; some lower-risk patients can be treated in their own homes; and the disease can be identified sooner in others, preventing hospitalization.

In addition, the team developed a number of innovative tools – including videos, websites, apps, and cartoons for kids – to help those in high-risk communities to understand the disease and take preventative measures against it.

In 2016, work began on a follow-up project – Kidney Check – which will screen residents in Indigenous communities in Manitoba, Saskatchewan, Alberta, British Columbia and Ontario. Over the past two years, the CDIC team has worked to launch their screening, triage and treatment programs, developing updated equipment, apps, and teaching tools, and collaborating with Indigenous patient partners each step of the way.

Studying the benefits of exercise during dialysis

Exercise can have a beneficial effect on the health of those living with chronic kidney disease. In 2018, CDIC researchers began a two-year study looking to determine if exercise helps those on hemodialysis by decreasing the number and severity of their symptoms.

Symptoms like fatigue, difficulty sleeping and cramping are extremely common in people receiving hemodialysis. These symptoms are difficult to treat and affect an individual's ability to participate in daily activities and enjoy life.

The study involves 150 patients from three Winnipeg hospitals, half of whom will complete an exercise program that has them riding a stationary bike while undergoing hemodialysis, and participating in a strength training program. The research team will measure the symptoms these patients experience and compare them to those receiving standard care.

Predicting fracture risk in patients with chronic kidney disease

The Fracture Risk Assessment Tool (FRAX®), developed at the University of Sheffield, is a tool used worldwide to evaluate the 10-year probability of bone fracture risk. It was developed to predict this fracture risk in the general population, but whether it was applicable to patients with chronic kidney disease (CKD) was unknown.

A 2018 study by CDIC researchers using data on 10,000 individuals showed that the FRAX® tool does indeed accurately predict bone fracture for people with CKD. Their results showed that regardless of an individual's stage of kidney disease, the tool was accurate. These findings support the use of FRAX® to identify patients with moderate to severe CKD who are at high risk for fracture events – similar to how the tool is currently used for the general population.



A leap forward: home-monitoring kits for CKD patients

The future of chronic kidney disease management got brighter in 2018 when CDIC researchers piloted a home patient monitoring system for CKD patients who are soon to transition to dialysis.

Currently there are no tools to predict when a patient with late-stage kidney disease will need to start dialysis treatments. This creates a scenario where thousands of patients “crash” into dialysis, meaning they must undergo emergency dialysis and can be unexpectedly hospitalized. The new CDIC tool kit looks to prevent that. The kit contains tools that guide patients – in their homes – through a daily self-assessment routine and weekly symptom questionnaire. When the CDIC team receives this data, they analyze it with the goal of developing prediction models that will estimate the optimal timing for the start of dialysis for each patient.

This kit represents a revolutionary step forward both for CKD patient care and for healthcare system efficiency. More than 90% of patients who have tested the kit “strongly agree” that it has helped them in caring for their chronic kidney disease.

The first phase of testing the kits will be completed in early 2019.

Sharing the science of prevention

As leaders in chronic disease prevention and management, the CDIC team has the knowledge to help people in the community understand the science of disease prevention, so they can take action in their own lives to stay healthy. In 2018, two public events gave people the chance to learn how to enhance their health.

In February, bestselling author Dr. Michael Greger shared information on the foods scientifically proven to prevent and reverse disease. And in June, author Timothy Caulfield explored the relationship between celebrity culture and our individual health choices, based on his book, *Is Gwyneth Paltrow Wrong About Everything? When Celebrity Culture and Science Clash*. This June session also featured a thought-provoking discussion with a panel of healthcare experts from CDIC and the Wellness Institute.

These popular events are part of an ongoing speaker series hosted in partnership with the hospital’s Wellness Institute and the Seven Oaks General Hospital Foundation.

Modernizing hemodialysis care for the benefit of patients

Patients with chronic kidney disease interact with our medical system often and in myriad ways. If we can improve the experience for these individuals, we can help to ease the stress they and their families face day to day.

To this end, CDIC researchers continue to co-lead the multi-year Can-SOLVE CKD Triple I project – funded by the Canadian Institutes of Health Research – to determine how to change hemodialysis care to make it a better experience for patients and their caregivers. This includes studying how to improve the information patients receive, the interactions they have with medical staff, and the individualization of their care.

Demonstrating the benefits of home dialysis

For patients with end-stage kidney failure, a key priority is maintaining their independence and quality of life for as long as possible. The option of home dialysis – versus in-hospital dialysis two or three times per week – is therefore very appealing for these patients.

In 2018, a costing study by CDIC researchers confirmed that home modalities – which include hemodialysis and peritoneal dialysis – are both lower in cost than dialysis performed at a hospital, including the cost of training patients to conduct their dialysis at home. As the costs for providing dialysis care continue to rise, this study demonstrates that home dialysis programs are good both for the patient and healthcare systems.

Helping more Manitobans perform dialysis at home

It is well documented that when chronic kidney disease patients can undergo dialysis at home instead of in a hospital, their well-being, outcomes, and quality of life improve. Another key benefit of home dialysis is that it comes with a much lower cost to the health system.

In 2018, the CDIC team started work on an integrated data platform to improve system efficiencies – including the ability to identify patients for whom home dialysis is a viable option. Called Home First, the project will use the platform to identify patients for whom home dialysis is suitable, predict the start time of their dialysis, and launch the equipment and human resources needed to make it happen. For patients in northern communities, the program has the potential to keep them in their homes and communities with their families, instead of relocating them to an urban centre for treatment.

CDIC is developing the platform in partnership with Manitoba Health, with funding from the CIHR's *Rewarding Success initiative* – a new funding model that rewards the success of research teams whose work produces healthcare cost savings or improves health system efficiencies. Demonstrated savings are then returned to the research teams to reinvest in health care and research priorities.

Partnering with the private sector

The wide-ranging skills of the CDIC team and CDIC's market-friendly know-how lend themselves to providing expertise to the private sector.

CDIC can deliver value to industry with services at every stage of the research and development process for pharmaceuticals, healthcare products, services, and technology. Researchers can harness big data to answer questions and produce scientific and economic reports regarding treatment, cost-effectiveness, and risk prediction.

CDIC research vision

✓ 12 MONTHS

CDIC scientists will be working in a physical environment commensurate with the world-class research and innovation they are conducting.

Examples of our expertise at work:

Clinic optimization for kidney health providers

We have deployed the Kidney Failure Risk Equation in many contexts to improve the care for patients with chronic kidney disease.

Pharmacoepidemiology for manufacturers

Our expertise in big data can help pharmaceutical companies to analyze drug utilization, outcomes and effectiveness through population health data.

Medical device development testing

We frequently consult on the introduction of new devices and compare the effectiveness and costs of existing devices in the marketplace.

Informing policy for public or private insurers

A growing number of private and public insurers are interested in CDIC's capacity for big data analysis to reduce risk and improve products and service for their customers.

Health economics

The CDIC research team can answer questions and provide data to healthcare systems and providers to support their decision making a time when the burden of caring for those with chronic disease is increasing.

✓ 3 YEARS

CDIC will have established a sustainable business model with contract work and be developing marketable intellectual property.

5 YEARS

CDIC will have leveraged intellectual property to generate revenue to support ongoing research.

10 YEARS

CDIC will have successfully spun off commercially viable products and IP into the private sector.

Publications

(CDIC author names in bold)

Impact of Exercise Counselling on Physical Function in Chronic Kidney Disease: An Observational Study

Bohm C, Storsley L, Hiebert B, Nelko S, **Tangri N**, Cheskin L, McAdams-DeMarco M, **Rigatto C**

Canadian Journal of Kidney Health and Disease, February 2018

Screening for kidney disease in Indigenous Canadian children: The FINISHED screen, triage and treat program

Dart A, Lavallee B, Chartrand C, McLeod L, **Ferguson T**, **Tangri N**, Gordon A, Blydt-Hansen T, **Rigatto C**, Komenda P

Paediatrics and Child Health, April 2018

Time to Implement the Kidney Failure Risk Equation into Pediatric Practice

Dart A, Komenda P, **Tangri N**

JAMA Pediatrics, February 2018

Conventional risk factors associate with meaningful outcomes in advanced CKD

Collister D, **Tangri N**

Kidney International, May 2018

Safety of Intravenous Iron in Dialysis: A Systematic Review and Meta-Analysis

Hougen I, Collister D, Bourrier M, **Ferguson T**, Hochheim L, Komenda P, **Rigatto C**, **Tangri N**

Clinical Journal of American Society of Nephrology, March 2018

Fracture risk and treatment in chronic kidney disease

Connelly K, Collister D, **Tangri N**

Current opinion in nephrology and hypertension, May 2018

Effect of post-discharge virtual wards on improving outcomes in heart failure and non-heart failure populations: A systematic review and meta-analysis

Uminski K, Komenda P, Whitlock R, **Ferguson T**, Nadurak S, Hochheim L, **Tangri N**, **Rigatto C**

PLOS One, April 2018

All that glitters may not be gold: Changes in serum creatinine may not be the criterion standard for acute kidney injury

Arora RC, **Tangri N**

The Journal of Thoracic and Cardiovascular Surgery, June 2018

Patterns of emergency department utilization by patients on chronic dialysis: A population-based study

Komenda P, **Tangri N**, Klajncar E, Eng A, Di Nella M, Hiebert B, Strome T, Lobato de Faria R, Zacharias J, Verrelli M, Sood M, **Rigatto C**

PLOS One, April 2018

Remote Dwelling Location Is a Risk Factor for CKD Among Indigenous Canadians

Harasemiw O, Milks S, Oakley L, Lavallee B, Chartrand C, McLeod L, Di Nella M, **Rigatto C**, **Tangri N**, **Ferguson T**, Komenda P

Kidney International, July 2018

A Learned Soul to Guide Me: Listening to the Voices of those Living with Kidney Disease to Inform Physical Activity Programming

Parson T, Bohm C, Poser K

Physiotherapy Canada, Summer 2018

CKD and Sedentary Time: Results from the Canadian Health Measures Survey

Glavinovic T, Ferguson T, Komenda P, Rigatto C, Duhamel T, Tangri N, Bohm C

American Journal of Kidney Disease, October 2018

Cost of Dialysis Therapy by Modality in Manitoba

Beaudry A, Ferguson T, Rigatto C, Tangri N, Dumanski S, Komenda P

Clinical Journal of American Society of Nephrology, August 2018

FRAX® Predicts Fracture Risk in Patients with Chronic Kidney Disease

Whitlock R, Leslie W, Shaw J, Rigatto C, Thorlacius L, Komenda P, Collister D, Kanis JA, Tangri N

Kidney International, September 2018

A Passive Mixing Microfluidic Urinary Albumin Chip for Chronic Kidney Disease Assessment

Wu J, Tomsa D, Zhang M, Komenda P, Tangri N, Rigatto C, Lin F

ACS Sensors, October 2018

Prevalence, socio-demographic characteristics, and comorbid health conditions in pre-dialysis chronic kidney disease: results from the Manitoba chronic kidney disease cohort

Chartier M, Tangri N, Komenda P, Walld R, Koseva I, Burchill C, McGowan K, Dart A

BMC Nephrology, October 2018

Predicting Hepatic Encephalopathy-Related Hospitalizations Using a Composite Assessment of Cognitive Impairment and Frailty in 355 Patients With Cirrhosis

Ney M, Tangri N, Dobbs B, Bajaj J, Rolfson D, Ma M, Ferguson T, et al

American Journal of Gastroenterology, October 2018

Intradialytic exercise preconditioning: an exploratory study on the effect of myocardial stunning

Penny J, Salerno FR, Brar R, Garcia E, Rossum K, McIntyre CW, Bohm C

Nephrology Dialysis Transplantation, December 2018

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