



Nova Scotia Health Authority
Research Annual Report 2017

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On the cover—clockwise from left: Clarissa Brisseau, Allen Penney & Dr. Susan Kirkland, Dr. Ratika Parkash & Joyce Cormier, Laura Burchell, RN, and Dr. James Robar

Meeting Our Health System Challenges

Research is a top priority for the Nova Scotia Health Authority (NSHA) and is playing an increasingly important role as we forge ahead with far-reaching changes in how we design and deliver health care in the province.

For example, research is guiding our steps in such giant efforts as reorganizing primary care and re-calibrating our approach to patients with complex needs who may also be old or frail.

While it's true we face many challenges in Nova Scotia—with our aging population and high rates of chronic disease—we also have many advantages. Not least among these is our talented and dedicated research community.

Our researchers have been working diligently for decades, with support from Research Services, our incredibly active Research Ethics Board and the health authority overall, to build a vibrant, collaborative research community that involves many professions, institutions and jurisdictions. Their efforts are paying off, as research is now becoming part of how we “do business” at NSHA.

A couple of months ago, I sent a survey to the employees, physicians and residents who work at NSHA, to learn more about the perception of research and appreciation of its value. I received an outstanding response—nearly 3,000 people completed and returned the surveys!

Of these respondents, 93 per cent felt research is essential to our ability to deliver up-to-date patient care. While not as many felt that research should be part of their job, I expect this will change in the very near future. As you will see in this report, our research teams are spending more and more time meeting with clinicians, policymakers, learners and patients across the province, to involve them in shaping the research agenda and launching their own practical research initiatives.

Thanks to the outstanding groundwork laid by our researchers and leaders in the past, we now have a broad-based consensus that research must be fundamental to our planning processes as we move forward.

We are seeing a new alignment in research interests and priorities—the health authority, Dalhousie and other universities across the province, the provincial government and community leaders all agree that research is vital to Nova Scotia's health care system, our economy and our society as a whole. With this alignment, we can build momentum and achieve great things.



Thomas Marrie

A handwritten signature in black ink that reads "T Marrie".

Thomas Marrie, MD
Interim Vice President of Research, Innovation & Knowledge Translation
Nova Scotia Health Authority

Studying the System

Research guides transformation of health service delivery

At a time when 40 per cent of Nova Scotia's budget goes to health care, the need for health system reform in Nova Scotia has never been greater. Senior leaders and researchers at NSHA are playing key roles in the research that's guiding necessary transformational change.

The Nova Scotia Health Authority and provincial government are turning to the research community as they consider how to improve patient outcomes and the efficiency and cost-effectiveness of health service delivery.

"It is essential that we have the data and evidence at hand to guide our decision-making as we address the extraordinary health care challenges we face in this province," says Lynn Edwards, NSHA's senior director of Primary Health Care and Chronic Disease Management. "Research enhances the leadership capabilities of our directors and managers throughout the entire system."

The amalgamation of Nova Scotia's nine health districts into a single provincial health authority has driven a new focus on primary care research.

"...[health care teams] are excited to see how they can use research to explore their options and test out new ideas."

"Timely access to quality and continuity of care is a key determinant of health," notes Dr. Emily Marshall, an NSHA-affiliated scientist and associate professor in the Dalhousie Department of Family Medicine. "When it is lacking, we end up with more serious illnesses and complications, bottlenecks in access to specialist care, overcrowded emergency rooms, and a host of other problems."

One well-researched way to improve the accessibility and quality of primary care is to shift from physician-only family practice clinics to interdisciplinary, collaborative team-based primary care. Over the past two years, the Nova Scotia government has earmarked \$35 million to launch collaborative team practices in the province.

"Research will be very important as we roll out the collaborative team-based model of care," says Dr. Rick Gibson, NSHA's senior medical director of primary health and the Department of Family Practice. "We're building research into the process from the beginning, so we





can identify the most effective ways for these teams to function... for example, who should be on the teams and what should be the various members' roles, the flow of patient care, the compensation model for physicians, nurses and other professionals on those teams? It's a massive effort."

NSHA and Dalhousie primary care researchers are working closely together on this and many other projects, with new impetus since the 2015 arrival of Dr. Tara Sampalli, NSHA's lead researcher in primary and integrated care. It is her role to build bridges between health authority operations and the research community to ensure research efforts are aligned with health system priorities.

"I've been travelling all across the province, working with teams to help them build their research capacity, identify research questions that will help them shed light on key issues, and secure small-scale grants," Dr. Sampalli says. "It's a ground-up approach that's really resonating with our teams... they are excited to see how they can use research to explore their options and test out new ideas. We are equally excited to have patients collaborating with us to shape our research vision and strategy in Primary Health Care."

As momentum builds and word spreads, Dr. Sampalli is getting calls from across Canada—and even from Scotland. "People want to learn from us, so they can apply some of the same ideas," she says. "What we're doing here in Nova Scotia—the alignment of research with health system priorities and collaboration with academics and patient partners—is really special."

Health system research in Nova Scotia seeks to ensure that all parts of the health care system are working in sync with each other. The system is complex; its study requires the involvement of many people in a variety of settings, including:

- primary care
- specialty clinics
- tertiary treatment centres
- emergency departments
- pharmacies
- mental health clinics & programs
- continuing care facilities
- rehabilitation centres
- community-based wellness programs
- patient's homes
- online

Improving Health in Complex Patients

Empowering patients to take charge of their self-care

When it comes to chronic and complex illnesses, patients' well-being stems from their ability to manage their own conditions over the long term. This requires a paradigm shift in which health professionals deliberately empower patients to take charge of their own health.

The old model of simply “following the doctor’s orders” to keep symptoms in check is clearly not working. As NSHA-Dalhousie behavioural psychologist and researcher Dr. Michael Vallis points out, only half of all prescribed medications in the world are taken as instructed (according to the World Health Organization).

“Empowerment and counselling are essential—as professionals, we can’t just ‘tell’ people what to do,” Dr. Vallis says. “First, we have to listen to them, make sure we understand their concerns, and then educate, advise, motivate and support them with a collaborative plan.”

Dr. Vallis and his colleagues at NSHA’s Behaviour Change Institute have been exploring how clinicians can most effectively motivate patients to change their health behaviors for more than a decade. From this work, they’ve developed educational approaches and assessment tools so that health professional training programs can teach the necessary communication skills and attitudes.

The researchers have been testing these with Dalhousie’s MD and family medicine residency programs and recently published their professional competencies training model in *The Journal of Public Health*.

At the same time, Dr. Vallis and Lynn Edwards, NSHA’s senior director of primary health care and chronic disease management, have secured an NSHA Translating Research Into Care (TRIC) grant to teach health care providers how to effectively screen for distress in patients with diabetes, starting with a pilot project in the Western Zone.

“Empowerment and counselling are essential—as professionals, we can’t just ‘tell’ people what to do...we have to listen... make sure we understand their concerns, and then educate, advise, motivate and support them with a collaborative plan.”

“Distress is very common in diabetes patients, ranging from disease-related distress that can be alleviated with better symptom management, to problems of living circumstances, to clinical depression,” Dr. Vallis notes. “It’s essential that providers know how to identify the type, degree and causes of distress, so they can refer patients to the appropriate supports and services.”

Medication self-management for complex patients

Pharmacist Heather Neville and a multidisciplinary team are running a study at the Nova Scotia Rehabilitation Centre to see how well a medication self-management program is working.

“Some patients have complex needs and often require multiple medications,” explains Ms. Neville. “The medication regimen can be overwhelming for them after they leave the rehab centre, especially if they’re dealing with cognitive problems caused by a stroke or other brain injury.”

The observational study will allow the research team to gauge the effectiveness of their program and identify and correct any weaknesses. “We want to know if the education and tools we provide are really helping patients keep track of their medications and take them as directed,” says Ms. Neville, “so they can reduce their risk of adverse events and feel more confident to return home.”

Building a research network focused on complex needs

Health system leaders have joined forces with researchers, clinicians and patients across the province to build a research network focused on finding better ways to serve patients with complex needs.

Building Research for Integrated Primary Healthcare in Nova Scotia (BRIC NS) is all about building—building a provincial research network and building capacity to conduct patient-oriented health research in every corner of Nova Scotia.

“BRIC NS is building the community of researchers across the province to examine how we're caring for complex patients and to devise, test and evaluate innovative new approaches to service delivery,” says Dr. Rick Gibson, clinical lead of BRIC NS and senior medical director of primary health and the Department of Family Practice for NSHA.

Launched in 2015 with funding from the Canadian Institutes of Health Research Strategy for Patient-Oriented Research, BRIC NS is part of a Canada-wide collaborative research “network of networks” focused on patients with or at risk of developing chronic health conditions and related complex needs.

“If we can provide more efficient and effective ongoing care to high-risk, complex-needs patients, we can prevent catastrophes in people’s lives and dramatically reduce our health care costs,” says BRIC NS scientific lead, Dr. Fred Burge, professor in the Department of Family Medicine. BRIC NS has helped research teams secure funding and

launch research projects to explore: what patients really want and need in team-based, patient-centred care; how to provide integrated end-of-life care that allows people the dignity of dying at home; and, how to evaluate new paramedic approaches as they provide palliative care in people’s homes, rather than transferring them to a hospital.

“So far, 74 per cent of the funding proposals we’ve been involved in have succeeded,” notes Beverley Lawson, primary care researcher and network director of BRIC NS. “We’re optimistic about the proposals we have just submitted to CIHR.”

Compassionate care at the end of life

Patients’ complex needs near the end of life range from the physical to the emotional to the spiritual, requiring an organized, multidisciplinary approach and a lot of support for the family if the person wishes to die at home. Through BRIC NS, Dr. Grace Warner, an associate professor in the Faculty of Health Professions at Dalhousie, is collaborating with NSHA primary care researcher, Dr. Tara Sampalli and colleagues in Prince Edward Island, to learn how services in the community can be better integrated with primary health care to improve symptom control, reduce stressful visits to emergency, and allow more people to die with dignity at home.



Left: Dr. Fred Burge, Beverley Lawson, Lynn Edwards and Dr. Rick Gibson
Right: Dr. Grace Warner and Dr. Tara Sampalli, courtesy BRIC NS



Creating Solutions to Health System Challenges

Novel research projects overcome access gaps

Nova Scotia's population is aging and facing a heavier-than-ever burden of chronic disease. At the same time, larger numbers of doctors are retiring—for they, too, are getting older. The resulting loss of access demands creative new approaches to connect patients with providers and empower them to manage their own health.



Exploring alternatives to one-on-one appointments

Patients in Hants and Digby counties are part of preliminary NSHA Research Fund-supported efforts to test drive group medical visits for patients with chronic disease.

“Group visits may offer an efficient and effective alternative to one-on-one doctor visits,” notes Dr. Tara Sampalli, NSHA’s director of research and innovation in primary care. “We’re investigating this possibility—not only as a means of connecting unattached patients to care, but as a potentially better way to empower people to manage their own health.”

The researchers hope their exploration of group visits will lead to improved access to timely and relevant care.

Group diabetes care at the Hants Community Hospital

In Hants, patients with diabetes take part in group visits through the Hants Health and Wellness Team (HHWT), which takes a multidisciplinary approach to helping them self-manage their condition.

“Patients take the lead by asking questions, which are answered by a dietitian, registered nurse, or physiotherapist,” says Lindsay Sutherland, health service manager for HHWT. “Topics could include the impact of stress, nutrition and physical activity on blood sugar levels,

and how to achieve optimal blood sugar control with all the things that life can throw at you.”

“You feel like you can get all of your questions answered and that you have the support of new friends. The program has really helped me control my diabetes.”

Prior to the start of each session, HHWT members check patients’ blood pressure and weight and assess their feet as required. While one team member facilitates the group session, another accompanies each patient in turn to see an internist one-on-one, to review lab results and adjust medications as needed.

Shirley Clarke—a resident of Glooscap First Nation who’s been living with diabetes for 40 years—has learned so much, she’s down four clothing sizes and feels better than she has in years.

“You feel like you can get all of your questions answered and that you have the support of new friends,” Shirley says. “The program has really helped me control my diabetes.”

Left: Shirley Clarke meets one-on-one with internist Dr. Colin van Zoost as part of group health care visits at the Hants Community Hospital. Right: Patients learn about the importance of physical activity and blood sugar levels from physiotherapist Bonnie Doyle.

The challenge of unattached patients

Primary care researcher Dr. Emily Marshall is digging deeper into the experience of unattached patients in Nova Scotia, in collaboration with NSHA researchers and decision makers like Shannon Ryan Carson, with support from the NSHA Research Fund.

“We want to know how these patients are faring... what their needs are and how they’re accessing services,”

Serving unattached patients in Weymouth

At the western end of the province, nurse practitioner Terrilee O’Connell has led the charge to offer group medical visits to unattached patients.

“We were concerned about the growing number of people with high blood pressure, high cholesterol, obesity and other risk factors who were not being followed by a consistent provider,” she says. “A number of physicians had retired, leaving a gap. We wanted to help people develop the skills to manage their symptoms and prevent complications.”

Michele LeBlanc, health service lead for primary health care in the Western Zone, facilitates the groups. “We’re working with Dr. Tara Sampalli at NSHA now to incorporate research into our processes,” she says. “Research will help us make the most out of this new model of care.”

Empowering providers to prescribe exercise

NSHA is locally facilitating Exercise is Medicine, a knowledge translation initiative that’s giving health

The goal is to shift the culture so that physical activity is understood, practiced and prescribed...ultimately, this will reduce the burden of chronic disease.

care providers across the province the knowledge and confidence to literally prescribe exercise to their patients.

“We’ve found that health care providers who take part in the Exercise is Medicine workshops have substantially higher confidence to offer physical activity counselling,” says the project’s scientific lead, Dr. Jonathon Fowles, professor in the School of Kinesiology at Acadia University in Wolfville. “Our data shows that physicians, nurses and other providers who do the training prescribe more physical activity and have much more confidence in their patients to do the activity.”

The goal is to shift the culture so that physical activity is understood, practiced and prescribed as a vital part of everyone’s health care plan. Ultimately, this will reduce the burden of chronic disease.



Dr. Emily Marshall discusses unattached patients with NSHA CEO Janet Knox

Dr. Marshall says, adding that, “More than 10 per cent of Nova Scotians over the age of 12 lacked a regular provider in 2014 and we believe that percentage has increased since.”

In related studies, Dr. Marshall found that only 9.6 per cent of family physicians and nurse practitioners in the province were taking on new patients unconditionally in 2014. That number had dropped to 3.1 per cent in a follow-up survey in August 2017. “We’re finding that complex patients are more often seeking care in emergency departments,” she says, “but the evidence clearly shows that such lack of continuity increases the risk of problems.”

The solution is not as simple as just getting more doctors to replace those who are retiring.

“There may be more efficient ways than traditional office visits to meet these patients’ needs—but we must understand their needs in order to know,” says Dr. Marshall. “We’re surveying patients, providers and policymakers and working with six other provinces to explore this issue in depth. We can all learn from each other how to meet this challenge with effective, evidence-based solutions.”

Managing Chronic Disease

Virtual heart clinic may improve arrhythmia patients' survival and quality of life

Atrial fibrillation (AF) is an irregular or rapid heartbeat that affects 10 per cent of the population over the age of 80. AF is a chronic condition that regularly sends people to emergency with shortness of breath, chest pain and other severe symptoms. Unmanaged, it can lead to stroke, heart failure or sudden cardiac death.

Researchers at NSHA are pioneering ways to improve AF patients' health and quality of life. Cardiologists Dr. Ratika Parkash and Dr. John Sapp are collaborating with behavioural psychologist Dr. Chris Blanchard and Halifax-based Kinduct Technologies to develop and pilot a virtual clinic to follow patients with AF.

"We found in earlier research that AF patients are able to manage their condition best when they make regular visits to a nurse-run clinic," explains Dr. Parkash, who is lead investigator on the NSHA Research Fund-supported project. "But this is not an affordable service for the health care system, so we decided to see if we could replicate the benefits using a virtual platform."

The virtual AF clinic will allow patients to access their own health data—including heart rate, blood pressure, weight, food intake, and activity level—through an online portal. The portal will also connect them to their personalized arrhythmia care plan, feedback on their progress, and advise about when to seek immediate or urgent medical attention. If they need more support, they can receive

online coaching from an AF-trained nurse. "Patients will be evaluated by a specialist and, if they enroll in the study, taught how to use the portal," says Dr. Parkash. "This includes instructions for entering their own data—such as weight, heart rate and activity levels—into the portal."

As Dr. Parkash explains, many patients with AF are afraid to exercise, but vigorous exercise is one of the most effective ways to manage the disease. "We want to empower AF patients to take control of their condition," she says. "Patients can dramatically reduce their risk by exercising, limiting alcohol, eating healthy, and managing blood pressure."

After 100 patients have been followed through the virtual clinic for a year, the researchers will compare their rates of AF-related emergency visits and cardiac hospitalizations to those of patients who received standard care. Their main goal for the pilot study is to confirm patients use the portal. "If patients embrace the concept and find it beneficial," says Dr. Parkash, "we will scale up to a larger study that will validate the impact on health outcomes and system use."

"We want to empower AF patients to take control of their condition... if patients embrace [the portal]... we will scale up to a larger study that will validate the impact on health outcomes and system use."

Patients (like Joyce Cormier, with Dr. Parkash, right) taking part in the atrial fibrillation "virtual clinic" receive devices to track physical activity, heart rate and rhythm, so researchers can see how activity impacts their heart health over the study period.



Diverse efforts improve well-being of cancer survivors

The population of cancer survivors is steadily growing as cancer rates rise and new treatments save more lives, but many survivors face ongoing pain, functional limitations, health problems stemming from treatments, and the possibility of recurrence. NSHA researchers are working to prevent complications and improve the well-being of cancer survivors who are living with cancer as a chronic disease.

Leading efforts to improve health care and quality of life for cancer survivors in Nova Scotia is Dr. Robin Urquhart, Ramia Scientist in the NSHA/Dalhousie Department of Surgery. Dr. Urquhart is literally one of a kind. She is the only researcher in Atlantic Canada to receive a Foundation Grant through the Canadian Institutes of Health Research's 2016-2017 competition. The fact that she won this coveted five-year, \$960,000 award is a testament to the quality and vision of her work.

“The CIHR Foundation Grant is allowing us to build a solid program of research so we can develop, test, refine, implement and evaluate new pathways to improved care for cancer survivors,” she says. “This includes building capacity in primary care to serve these patients’ often-complex needs, improving coordination between primary and specialist care, and ensuring rapid response to suspected recurrences.”

Involving survivors, families and health care providers in the research is a key part of Dr. Urquhart’s program. “It

doesn’t matter how ‘good’ my research is if it doesn’t focus on what’s important to survivors and people in the health care system,” says Dr. Urquhart. “The research has to be relevant to make an impact.”

“It doesn’t matter how ‘good’ my research is if it doesn’t focus on what’s important to survivors...the research has to be relevant to make an impact.”

Other NSHA researchers are improving quality of life for cancer survivors by improving treatments. In head and neck cancer, for example, surgical oncologist Dr. Matthew Rigby is pioneering new surgical procedures to minimize post-op morbidity and the chance of recurrence. Medical physicist Dr. James Robar, meanwhile, is developing new technology to improve the precision of radiation beam targeting, to prevent long-term negative effects—such as cognitive problems, vision loss and partial paralysis in patients with head and neck cancers.



Precision radiation

Many complications of radiation therapy could be prevented with more precise beam targeting. Dr. James Robar, NSHA Medical Physics’ chief of staff, is developing a technology that detects patients’ slightest moves—to less than a millimetre—so treatment can be stopped until the patient is perfectly still. He and his team are working with BrainLab and funding from Atlantic Canada Opportunities Agency to take the technology to the global market.

Mapping Patterns of Health System Use

SARV study sheds light on hotspots of high system use

An investigation of health-system use in Nova Scotia has found that two-thirds of the province's health care resources are spent on a very small fraction of the population—approximately five per cent.

“We found clusters of high-cost use in communities across the province, primarily in rural areas,” notes Dr. George Kephart, lead investigator of the SARV (Small Area Rate Variation) study. “A lot of the variation in health care use can be attributed to age and higher rates of chronic diseases in some areas, of course... but we took this into account in our analysis and still found wide variations. What is going on in these ‘hotspot’ communities?”

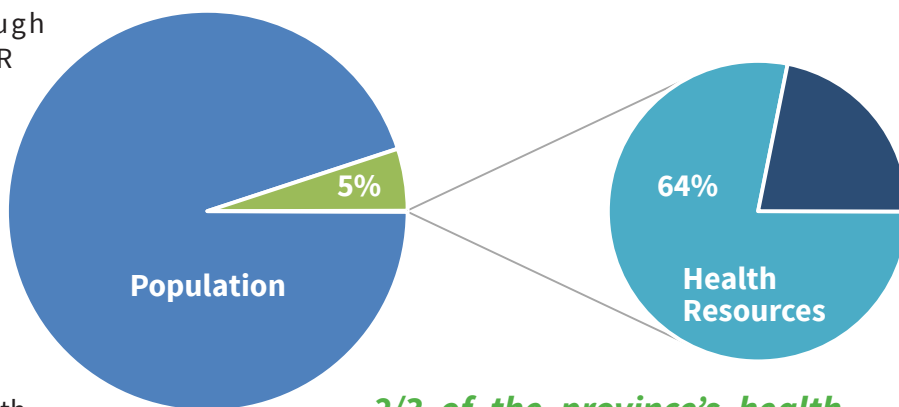
Conducted through the Maritime SPOR Support Unit, the SARV study examined administrative health data to learn more about patterns of high health care use across Nova Scotia.

The Nova Scotia Health Research Foundation (NSHRF) and Canadian Institutes of Health Research (CIHR) funded the initial research, which involved patients and their care navigators as advisors.

“Our patient advisors and care navigators raised questions about how to better meet the needs of people who use the health system a lot,” says Dr. Kephart, an NSHA-affiliated scientist and professor in the Department of Community Health & Epidemiology. “They felt that high-cost use in hotspot communities results from poor management of chronic disease and needs to be addressed through improved community-based primary health care.”

Lynn Edwards, NSHA's senior director of Primary Health Care and Chronic Disease Management believes learning more about hotspot communities is important to inform changes in the system. She and her team are collaborating with Dr. Kephart and researchers in BRIC NS to learn more.

“Our next step is to further understand the information revealed by SARV, through purposeful, in-depth conversations with patients and providers,” Ms. Edwards says. “By gaining a deeper understanding of what is happening in each community—in terms of service availability, community supports and social conditions—we will be able to work more effectively with those communities to address unmet needs.”



2/3 of the province's health care resources are spent on a very small fraction of the population—approximately 5%

NSHA will use this information to design health service solutions for patients with complex health care needs in different communities.

As Ms. Edwards says, “In the long run, such targeted efforts will prevent needless suffering, improve health in our

communities, and potentially save millions of health care dollars.”

Dr. Kephart and Ms. Edwards have received additional funding from NSHRF to learn more. For example, they're working with the Department of Community Services to investigate the role of poverty and housing in high health-system use.

Visual Source: Kephart G, Asada Y, Atherton F, Burge F, Campbell LA, Campbell M, Dowling L, Dyer J, Lawson B, Lethbridge L, Levy A, Terashima M (2016). Small area variation in rates of high-cost healthcare use across Nova Scotia. Maritime SPOR Support Unit. Halifax, Nova Scotia. Page 12 & Page 31.

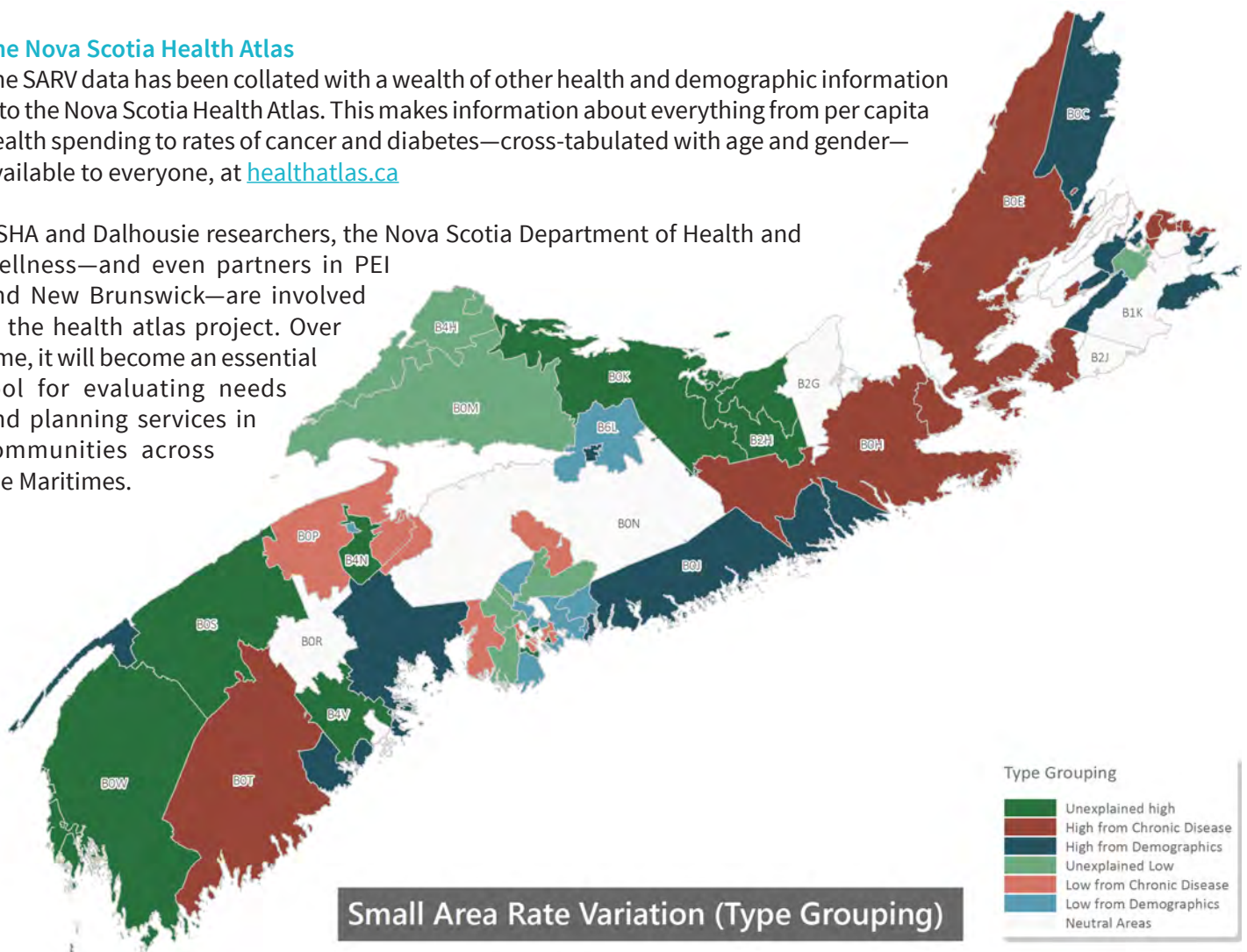
“Persons with high health care use and complex needs are diverse... we need to identify and learn from different groups of patients who have high system use for different reasons,” Dr. Kephart says. “Insights from these patients and their families are the starting point for learning what supports will work for whom, in what contexts, and why.”

Dr. Kephart, Ms. Edward’s NSHA team, and an interdisciplinary group of researchers at BRIC NS have teamed up with researchers and policy makers in three other provinces to take the next big step. They’ve applied to CIHR for funding to conduct a four-year study, which will delve into many other factors—such as income, social connections and mental health—in continued efforts to improve services and outcomes for patients with complex needs.

The Nova Scotia Health Atlas

The SARV data has been collated with a wealth of other health and demographic information into the Nova Scotia Health Atlas. This makes information about everything from per capita health spending to rates of cancer and diabetes—cross-tabulated with age and gender—available to everyone, at healthatlas.ca

NSHA and Dalhousie researchers, the Nova Scotia Department of Health and Wellness—and even partners in PEI and New Brunswick—are involved in the health atlas project. Over time, it will become an essential tool for evaluating needs and planning services in communities across the Maritimes.



By mapping the patterns of health system use across Nova Scotia (by postal codes)—and digging deeper into the reasons for the variations they found—the researchers behind the Nova Scotia Health Atlas are shedding light on pathways to more efficient and effective care province wide.

Understanding the Process of Aging

20+ year study sheds light on how Canadians are aging

3,000 Nova Scotian volunteers (like Allen Penney, pictured with Dr. Susan Kirkland and Lindsay MacDonald below) in the Canadian Longitudinal Study on Aging come to NSHA every three years to be assessed for key indicators of healthy aging. These include bone mineral density, arterial health, body composition, blood pressure, vision, hearing, cognition, gait, hand grip strength, balance, cognitive function, blood markers for inflammation, nutritional status and risk for disease.



Aging is a complex process involving a lot more than the passage of time. Engagement with family, friends and community, access to transportation, services and financial resources, and degree of physical activity are just some of the factors that influence how healthy a person remains, and for how long. The Canadian Longitudinal Study on Aging (CLSA) is learning more.

Citizens and researchers in Nova Scotia and across Canada are working together to understand how well people are aging, what factors have the greatest influence, and how policies and programs impact people's well-being with age.

"We've recruited a cohort of 50,000 Canadians—4,500 in Nova Scotia—who were between the ages of 45 and 85 during the study's enrollment period from 2010 to 2015," says study co-lead Dr. Susan Kirkland, head of the Department of Community Health & Epidemiology at Dalhousie and NSHA. "As we follow people over time, we will gain a clearer picture of the health of our aging population and what's coming down the road. This will help in planning health and community services."

Dr. Kirkland and her team are following 1,500 Nova Scotia participants by phone and visit 3,000 others in their homes every three years. The larger group also

visits the CLSA data collection site in Halifax for physical assessments. "In addition to providing us with detailed information about our aging population in Nova Scotia, the CLSA allows us to make comparisons with other provinces," she says. "It will shed light on what kinds of services, interventions, programs and policies work."

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Thanks to funding from the NSHA Research Fund, Dr. Kirkland's team is contributing a new health assessment to the CLSA. Postdoctoral fellow Dr. Joshua Armstrong used the funding to create a frailty index, by combining a wide range of health variables collected on CLSA participants. This will be used to establish a baseline frailty score that can be repeated to track frailty over time.

"Tracking frailty will reveal so much about how to provide the best care for people in vulnerable states," Dr. Kirkland says. "We hope it will also reveal how best to prevent and even reverse it."

Virus research aims to prevent or reverse immune-system aging

As we age, our immune system becomes exhausted after years of fighting pathogens and malignancies. Vaccines no longer protect us as well from disease, and our immune system is less and less able to mount an effective defense on its own. Uncovering the mechanisms behind this gradual decline is revealing strategies for preserving our immunity as we age.



Dr. Lisa Barrett reviews patient data along with Dr. Sharon Oldford

Infectious diseases specialist Dr. Lisa Barrett is studying the blood of patients with chronic viral infections to learn how the immune system becomes worn down.

“By tracing how this immune-age-reversal process unfolds in patients with chronic infections, we hope to learn how we can produce the same effect in the general population as people age.”

“It takes decades for the immune system to deteriorate in a healthy person—we need a model of accelerated aging,” explains Dr. Barrett, who divides her time between a busy infectious diseases clinic at NSHA and her lab at Dalhousie Medical School. “Chronic viral infections, like HIV and hepatitis C, provide us with that model... they put so much wear and tear on the immune system, it ages prematurely.”

Dr. Barrett and her research scientist, Dr. Sharon Oldford, have found that the immune cells of patients with HIV and hepatitis C look and act a lot like those of much older people who are virus free. In particular, the killer T-cells of both groups of people are covered with molecules that inhibit immune response. As a result, vaccines aren’t able to stimulate adequate immunity and they fall prey to infections.

The researchers want to find a way around this problem. Among many projects, they’re exploring immune exhaustion and poor vaccine response in HIV infection, with support from the NSHA Research Fund.

“We’re assessing many types of immune cells in HIV-positive patients, assigning an immune profile and ‘immune age’ to each individual, and tracking them over time,” says Dr. Barrett. “One of our goals is to learn which aspects of immune aging are associated with robust or weak responses to vaccines, so we can find a way to improve vaccine response.”

The same mechanism could be harnessed to improve vaccine effectiveness in older patients.

“Infections are a leading cause of hospitalization and death in older people,” notes Dr. Barrett. “If we can make vaccines work better for them, it would save years of good-quality life and health system resources.”

The researchers even aim to reverse immune-system aging.

“We see that immune-aging is largely reversed when patients with chronic viral infections are treated with potent new antivirals,” Dr. Barrett explains. “By tracing how this immune-age-reversal process unfolds in patients with chronic infections, we hope to learn how we can produce the same effect in the general population as people age.”

Assessing and Addressing Frailty

Research leads the way to compassionate care for the frail

Frailty is a compromised state of health that leaves a person vulnerable to sudden and serious declines. In Canada, one quarter of the people over 65 and half those over the age of 85 are frail. Frailty poses an immense challenge to individuals, families, the health system and society. NSHA researchers are measuring and tracking frailty to provide more sensitive, effective care.

Researchers at NSHA and Dalhousie University are global leaders in defining the concept of frailty. They've developed tools for quantifying frailty that are now used in Canada, the United Kingdom, the United States, China and other parts of the world.

"The frailty index captures the complete picture of a person's health," notes Dr. Kenneth Rockwood, NSHA-Dalhousie geriatrician and professor who, with mathematician Dr. Arnold Mitniski, pioneered the frailty index. "It shows how multiple health problems add up to various degrees of frailty. From there, people can make informed decisions about their health care."

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As Dr. Rockwood explains, frail individuals do not respond to standard treatments the same as more robust people do. Surgeries, drugs and combinations of multiple drugs (polypharmacy) can lead to complications and loss of function, and even independence, for the frail.

Researchers at NSHA are adapting and applying the frailty index and other locally developed assessment tools. They

want to ensure frailty is identified and properly addressed—whether it's showing up in a visit to the family doctor, an ambulance call, a geriatric day hospital, or the intensive care unit.

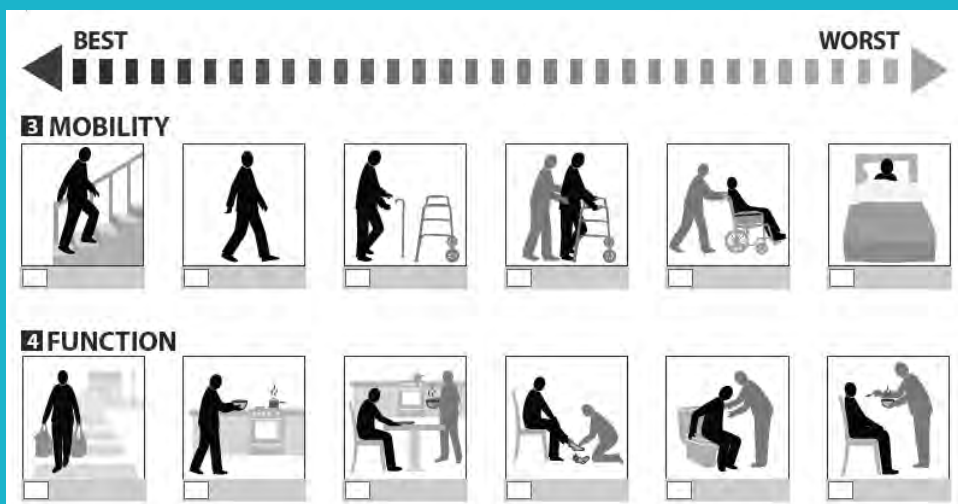
Measuring and tracking frailty has also revealed that steady decline is not the only trajectory. "We're finding that certain aspects of frailty can be reversed," Dr. Rockwood says. "Our research shows that reducing polypharmacy and improving mobility are two of the most powerful ways to boost resilience and achieve better outcomes."

Pictorial fit-to-frail scale provides a "picture of health"

Patients and their families can literally see where they sit on the continuum from fit to frail, when they work through a pictorial scale being tested in geriatric clinics at the Halifax Infirmary and St. Martha's Regional Hospital in Antigonish. Dr. Olga Theou and colleagues developed the scale, with funding from Nova Scotia Health Research Foundation, and are testing its usability and accuracy now with support from the NSHA Research Fund and the Canadian Frailty Network.

"The visual nature of the scale cuts through barriers of language and literacy, while giving a clear view of a person's health status," says Dr. Theou. "This is an enormous aid in planning for care and supports at home. We ultimately hope it will be used in all corners of the health care system."

The Pictorial Fit-Frail Scale was developed as a more practical approach to identifying frailty compared to previous scales. Patients and their families rate multiple domains including mood, medications, mobility (seen left), memory, pain and vision, among others. The scale is intended to assess a patient's usual state and patients are asked to mark one box that is representative. Changes can be tracked over time. The scale is currently part of a multi-site study to test its usability and accuracy.



In case of emergency, assess frailty

A trip to emergency can be distressing, even dangerous, for a frail person. “Emergency departments are set up to respond to acute crises... staff are not typically trained how to assess frailty, and frail patients may be at risk for dehydration or delirium,” notes Dr. Stacy Ackroyd, a longtime emergency medicine researcher who’s evaluating ways to improve the well-being of frail elderly people during their time in emergency.

Getting a handle on a person’s degree of frailty before or when they arrive at the emergency department is an important step to providing more appropriate care.

“Emergency departments are set up to respond to acute crises... staff are not typically trained how to assess frailty, and frail patients may be at risk...”

“We’ve adapted the clinical frailty scale so patients or family members can fill in the information on a tablet,” says Dr. Judah Goldstein, research coordinator for Emergency Health Services (EHS). “We’re testing the feasibility of this tool and educating staff so frailty becomes an important consideration not only in the triage process but throughout the person’s visit to emergency.”

Safeguarding the frailest of the frail

Frail people are overrepresented in the intensive care unit, where 30 per cent of patients over age 50 are frail. NSHA-Dalhousie geriatrician Dr. Sam Searle is studying how a frail person’s health status changes when a health crisis comes along, how this is affected by a stay in the ICU and if and how well they are able to recover their health, function and independence after discharge.

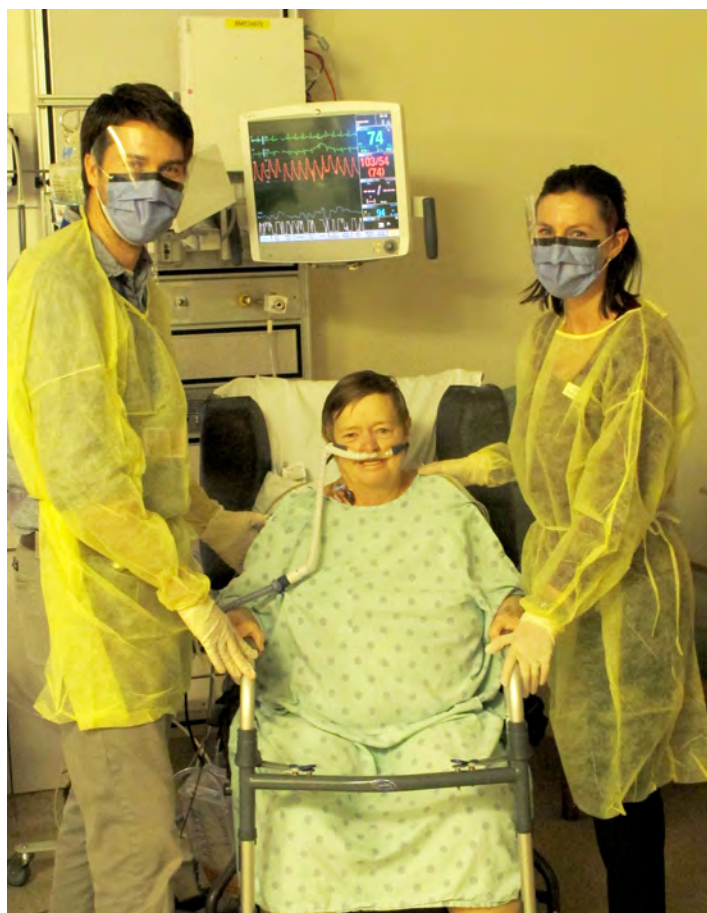
“We’ve found that one of the most important predictors of a person’s recovery is their mobility during their stay in the ICU,” Dr. Searle notes. “So now we’ve involved physiotherapists in assessing patients’ mobility—in addition to helping them move—as part of our study.”

Ultimately, Dr. Searle wants to ensure that ICU staff, patients and family members understand how frailty affects a person’s response to interventions—in such a precarious state, even an IV can cause problems. “Standard ICU protocols may not always be safe for frail patients,” he explains. “Everyone involved needs to understand the potential consequences of interventions, so patients and families can make informed decisions.”

Dr. Karthik Tennankore, meanwhile, is exploring the implications of frailty in patients on the waitlist for a kidney transplant. “We need to know more about how frailty affects the health of patients who are waiting for a kidney,” notes the NSHA-Dalhousie nephrologist. “We’re identifying sophisticated ways to make our assessments more objective to better inform how we prioritize patients on the wait list.”

Frailty Portal: doorway to intervention upstream

Researchers, decision makers, providers and patient advisors have created the Frailty Portal to help family doctors and other primary care providers identify and address emerging signs of frailty in their patients. “Our goal is to help providers work more proactively with their frail patients,” says Dr. Tara Sampalli, NSHA’s director of research and innovation in primary health care. “By educating patients about frailty, providers can help patients make more informed health care decisions and prevent many crisis situations.”



Dr. Sam Searle and physiotherapist Giselle Davis help patient Helen Joyce stay mobile during her stay in the ICU.

Nova Scotia Health Authority Research Fund (NSHA RF) Awards

September 2016 Nova Scotia Health Authority Research Fund Award Recipients

Name	Department	Award	Research Description
Chris Blanchard	Medicine/Cardiology	\$14,973	Getting Heart Disease Patients More Active and Less Sedentary: An eHealth/mHealth Feasibility Study
Alix Carter	Emergency Medicine	\$14,631	The New Role of EMS in Palliative Care: A Qualitative Study of the Perspectives and Experiences of Paramedics and Health Care Providers in Nova Scotia
Derek Fisher	Psychiatry	\$14,970	An Investigation of Sex as a Mediating Factor of the Auditory Mismatch Negativity's Utility as a Biomarker in Early Phase Psychosis
Jennifer Jones	Gastroenterology	\$46,339	Evaluation of Provincial Geographic Variation in Access to Inflammatory Bowel Disease Care: A Patient Oriented Research Project
Jason LeBlanc	Pathology & Laboratory Medicine	\$14,968	Urine Antigen Detection - A Goldmine for Pneumococcal Surveillance
Alex Legge	Rheumatology	\$4,960	Constructing and Validating a Frailty Index (FI) as a Novel Measure of Health Status in Patients with Systemic Lupus Erythematosus (SLE)
Emily Marshall	Family Medicine	\$15,000	The Lived Experience of Unattached Patients in Nova Scotia: A Mixed Methods Study
Abraham Nunes	Psychiatry	\$4,995	A Study of Goal-Directed and Habitual Control in Patients with Eating Disorders Using Computational Modeling
Karthik Tennankore	Nephrology	\$14,980	Physical Activity and Sedentary Behaviour in Dialysis: A Pilot Study
Noreen Walsh	Pathology & Laboratory Medicine	\$14,582	Molecular Findings in Different Subtypes of Merkel Cell Carcinoma and their Biological Implications

March 2017 Department of Medicine Special Ad Hoc Operating Grant Award Recipients

Name	Department	Award	Research Description
Lisa Barrett	Infectious Disease	\$25,000	Developing a Model of Immune Aging in a Prospective Atlantic Cohort
Leah Cahill	Clinician Scientist	\$25,000	Haptoglobin Phenotype and Risk of Incident CVD in the ACCORD Trial
Ravi Ramjeesingh	Medical Oncology	\$25,000	The PANcreatic Cancer Research platform to Examine biomarkers And Systemic treatment outcomes (PANCREAS)

NSHA Research Fund Committee

Dr. Kim Good, Co-Chair
Dr. Gordon Gubitz, Co-Chair

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 Dr. Jillian Banfield
 Dr. Lisa Barrett
 Dr. Steven Beyea
 Dr. Jeremy Brown

Dr. Heather Butler
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 Dr. Gail Eskes
 Dr. Dan Gaston
 Dr. Ron George

Dr. Andrew Glennie
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 Dr. Todd Hatchette
 Dr. Chris Kenyon
 Olga Kits
 Dr. Jason LeBlanc
 Dr. Emily Marshall
 Dr. Paige Moorhouse

Heather Neville
 Dr. Jennifer Payne
 Dr. Madelaine Plourde
 Dr. Gabrielle Richard
 Dr. Jai Shankar
 Amanda Tinning
 Dr. Robin Urquhart

March 2017 Nova Scotia Health Authority Research Fund Award Recipients

Name	Department	Award	Research Description
Martin Alda	Psychiatry	\$24,748	Stage-Specific Biomarkers of Bipolar Disorder
Clinton Campbell	Pathology & Lab Medicine	\$25,000	Defining the Genomic Landscape of Disease Evolution in Multiple Myeloma
Bal Chauhan	Ophthalmology	\$24,927	Modelling the Deep Optic Nerve Head of Patients with Glaucoma
David Clark	Nephrology	\$5,000	Towards a Better Understanding of Measuring Hospitalization in Dialysis: A Cohort Study
Tara Dahn	Family Medicine	\$1,070	End of Life Care in the Emergency Department - Family Perspectives
Ashley Drohan	General Surgery	\$4,833	The Uptake of Laparoscopic Rectal Cancer Surgery in Canada
Cynthia Forbes	Medicine	\$24,968	Feasibility of an eHealth/mHealth Physical Activity and Sedentary Behaviour Change Program Among Cancer Survivors
Rosalind Gerson	Diagnostic Imaging	\$5,000	Quantification of Hepatic, Splenic, and Pancreatic Fat Fraction and R2* by 3T MR in an Atlantic Canadian Cohort
James Gould	Emergency Medicine	\$5,000	Potential Candidates for Emergency Department Initiated Extracorporeal Cardiopulmonary Resuscitation (ECPR) in a Canadian Institution
Javeria Hashmi	Pain Management	\$49,794	Role of Brain Mechanisms of Learning and Expectation in Chronic Back Pain
Paul Hernandez	Respirology	\$24,400	Physical Activity and Sedentary Behaviour in Patients with Chronic Fibrosing Idiopathic Pneumonia
Zafar Hussain	Pathology & Lab Medicine	\$14,957	Determination of Vancomycin MIC and Correlation between Vancomycin MIC Values and those of Telavancin, Daptomycin, Cefazolin, and Oxacillin against Methicillin-susceptible Staphylococcus aureus Isolated from Patients with Bloodstream Infections by estest
Samuel Jessula	General Surgery	\$5,000	Mechanisms of Injury Priority Scores in Canada
Ketan Kulkarni	Hematology	\$14,040	Association of the Fecal Microbiome with Gastrointestinal Toxicity, Bloodstream Infections, Acute Graft-Versus Host Disease (GVHD) and Survival in Patients Undergoing Hematopoietic Stem Cell Transplantation (HSCT)
Simon MacDonald	General Surgery	\$5,000	The Management of Incisional Hernias: Current Practices of Canadian General Surgeons
Antonina Omisade	Acquired Brain Injury (Surgical Epilepsy Program)	\$20,796	Validation of Two Functional MRI Language Protocols for Pre-surgical Language Mapping
Ratika Parkash	Cardiology	\$25,000	Computer Simulated Atrial Fibrillation Tool to Reduce Hospitalizations and Emergency Department Visits
Jason Quinn	Nephrology	\$5,000	Diagnostic Phlebotomy Volume and the Need for Blood Transfusion - How Much is Too Much?
Glen Richardson	Orthopedic Surgery	\$24,712	Balancing Kinematically Aligned Total Knee Replacements During Total Primary Knee Arthroplasty Using Verasense™
Matthew Rigby	ENT	\$25,000	Implementation of an Intraoperative Margin Assessment Protocol in Head and Neck Cancer Surgery
James Rioux	Diagnostic Imaging	\$25,000	Evaluation of Emerging Methods for Quantitative MR Imaging of Chronic Pancreatitis
Ken Rockwood	Geriatric Medicine	\$25,000	Can Frailty Predict Adverse Health Outcomes in Emergency Department Older Patients?
Pejman Sadeghi	General Surgery	\$4,000	Analysis of Prognostic and Predictive Effects of KRAS Mutation Status in Early-Stage Resected Non Small-Cell Lung Cancer at Queen Elizabeth II Health Sciences Centre
Robin Urquhart	Surgery	\$24,970	Health Care Utilization for Survivors of Breast, Prostate, Colon, Rectal, or Gynecological Cancers in Nova Scotia

Translating Research Into Care (TRIC) Awards

The Translating Research Into Care (TRIC) health care improvement research program was established in 2013 with funding from the QEII Foundation and the IWK Foundation. The funding program supports research that will provide evidence and facilitate the translation of clinical science into improved health care policy, service delivery and patient care at the QEII Health Sciences Centre, the IWK Health Centre and across NSHA.

May 2016 TRIC Award Recipients

Name	Award	Research Description
Jai Shankar & Vicki Sorhaindo	Level 3 \$58,662	Implementation of a CT Perfusion as the Ancillary Test of Choice for Neurological Determination of Death in Intensive Care Units: Prospective Evaluation
Phillip Tibbo & Trevor Briggs	Level 3 \$59,545	An Investigation of the Effectiveness of Peer Support Interventions on Transitions from a Specialized First Episode Psychosis Program to Community Mental Health Care

November 2016 TRIC Award Recipients

Name	Award	Research Description
Virender Bhan & Trudy Campbell	Level 1 \$2,998	Identifying and Incorporating Patient and Provider Preferences into a Comprehensive Nursing Assessment for Follow-up MS Care
Michael Vallis & Tara Sampalli	Level 2 \$29,714	Changing Systems to Integrate Health Behavior Change Competencies into Primary Health Care
Jill Hayden, Samuel Campbell & Susan Delaney	Level 3 \$59,120	Reducing Inappropriate Diagnostic Imaging for Low Back Pain in the QEII Emergency Department
Alix Carter & Peter MacDougall	Level 3 \$59,868	A Notification System to Reduce Interventions for Patients Receiving Palliative Care Transported by Ambulance to the Emergency Department
Jai Shankar & Vicki Sorhaindo	Level 3 \$60,000	Implementation of “Rapid” Endovascular Thrombectomy (EVT) for Treatment of Acute Ischemic Stroke (AIS) - Prospective Evaluation

TRIC Grant Review Committee

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Susan Butts
Dr. Leah Cahill
Mary Ellen Gurnham

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Dr. Margot Latimer
Nicole Lawrence

Jevon MacDonald
Jim MacLean
Dr. Lidija Marusic
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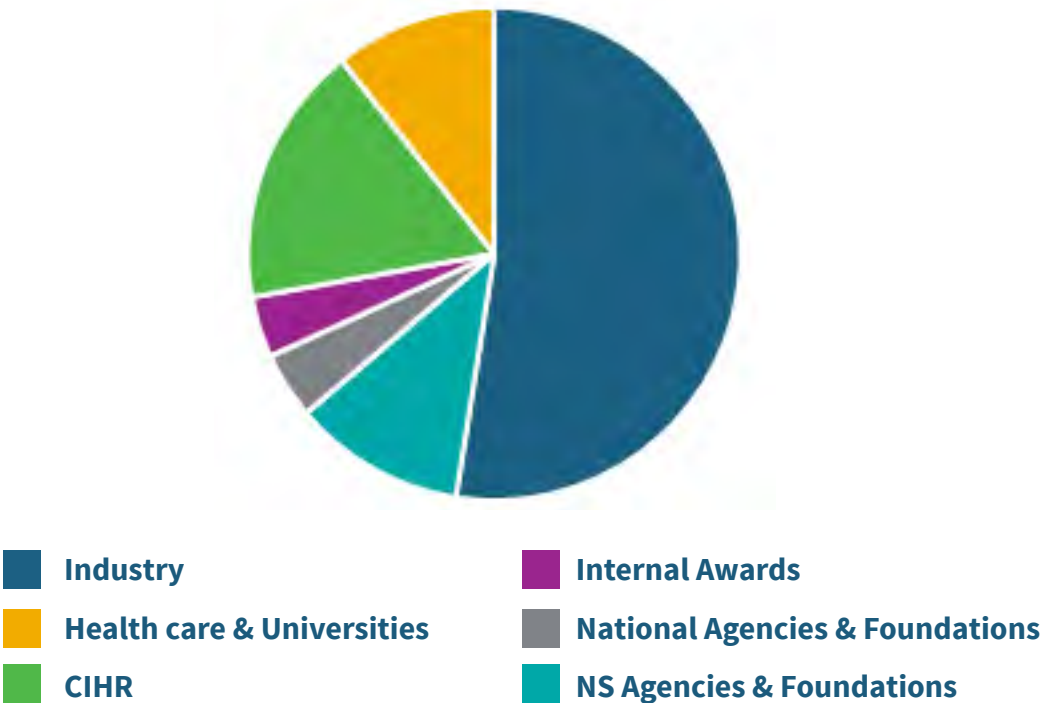
Mike Sangster
Dr. Isabel Smith
Dr. Nathalie St-Jacques
Dr. Phil Tibbo
Dr. Robin Urquhart
Victoria van Hemert

Awards for Research Conducted at NSHA 2016-2017 Fiscal Year

	Administered at NSHA	Administered at Dalhousie University
Research Grants	\$ 11,952,305.31	\$ 1,921,701.68
Research Contracts	\$ 11,098,990.82	\$ 168,995.10
Total	\$ 23,051,296.13	\$ 2,090,696.78

Total: \$ 25,141,992.91

Source of Awards for Research Conducted at NSHA 2016-2017 Fiscal Year



Nova Scotia Health Authority - All Research Accounts

Statement of Revenue and Expenses

for the Twelve Months Ended March 31, 2017

	Actuals 16/17	Actuals 15/16	Variance
Opening Balance April 1	35,431,210 \$	33,499,073	
Revenue			
Grants*	11,249,614	14,348,618	(3,099,004)
Contracts*	8,161,342	7,326,602	834,740
Interest and Realized Gain on Investments	1,217,241	875,017	342,224
Federal Research Support Program	938,463	773,743	164,720
Donations & Other Revenue	302,850	262,635	40,215
Ethics Review Fee	252,000	325,500	(73,500)
RMU Consulting Fee	104,700	121,100	(16,400)
Record Retention Fee	56,334	44,151	12,183
Gross Revenue	22,282,543 \$	24,077,366 \$	(1,794,823)
Expenses			
Compensation	14,715,367	13,594,382	(1,120,985)
Supplies and Services Expenses			
Transfers Offsite	2,026,636	2,620,323	593,687
Purchased Services/Professional Fees	1,791,519	1,100,669	(690,850)
Clinical Laboratory Services	828,333	521,527	(306,806)
Overhead to Dalhousie	707,022	623,444	(83,578)
Travel/Professional Development	567,409	527,100	(40,309)
Other Expenses	453,406	763,682	310,276
Diagnostic Imaging Services	348,647	336,683	(11,964)
Printing/Office and Computer Supplies	319,510	326,728	7,217
Pharmacy Services and Drugs	308,495	334,307	25,812
Travel-Patient	292,395	270,734	(21,661)
Equipment	264,689	556,828	292,139
Maintenance	223,349	139,995	(83,354)
Medical/Surgical Supplies	191,285	146,301	(44,984)
Communications	48,652	35,264	(13,388)
Recoveries of Expenses**	(289,055)	(297,077)	(8,021)
	8,082,290	8,006,507	(75,783)
Total Expenses	22,797,657 \$	21,600,889 \$	(1,196,769)
Net Inflow/Outflow	(515,115)	2,476,477	(2,991,592)
Unrealized Gain (Loss) on Investments	2,219,844	(544,341)	(2,764,185)
Ending Balance March 31, 2017	37,135,939 \$	35,431,210 \$	1,704,730
Overhead Distribution			
	16/17	15/16	Variance
NSHA Research Services	1,036,224	985,941	50,283
NSHA Research Development	159,940	217,325	(57,385)
Dalhousie University Departments	425,191	373,988	51,203
Faculty of Medicine, Dalhousie University	281,831	249,456	32,375
Total Overhead	1,903,186	1,826,711	76,475

* Includes overhead

** Recoveries allocated to appropriate grant/contract; balance attributed to hospital department recoveries

Research Staff & Research Ethics Board (REB)

Dr. Thomas Marrie

Interim Vice President Research, Innovation
& Knowledge Translation
Nova Scotia Health Authority

Sheryl-Lynn Forward, Executive Assistant



Research Services Staff

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Michelle Roden, Administrative Assistant

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Jennifer Thurlow, Coordinator, Grant Facilitation & Support
Stacey Pyke, Administrative Coordinator, Contracts & Grants
Jayne Sierens, Coordinator, Institutional Awards

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Judith Thompson, People Services Manager
Amy Wilson, Publications Coordinator
Katie McIsaac, Health Outcomes Scientist

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Jane MacLeod, Financial Analyst, Research

Research Development and Planning

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Elaine Strohm, Administrative Assistant

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Robin Latta, Northern Zone
Daniel Marsh, Western Zone

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Sandra Pauls, Finance & Administrative Officer
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Joe Fraser, Research Database Specialist
Olga Kits, Qualitative Methodologist
Kara Matheson, Biostatistician
Chris Theriault, Senior Research Database Specialist

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Gredi Patrick, Co-Chair
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Dawn Fougere, Zone 2 Executive Representative
Natalie Oake, Zone 3 Executive Representative

Ken Jenkins, Manager

Nadine Ransome, Administrative Coordinator
Starla Burns, Ethics Coordinator
Moira Fisher, Ethics Coordinator
Joan Morrison, Ethics Coordinator
Pamela Trenholm, Ethics Coordinator

In addition to the NSHA Research Ethics Board executive and office staff, the board has 110 volunteer members. These members are drawn from the community, the legal profession, medical staff and hospital employees.

The NSHA Research Annual Report is produced by NSHA Research Services:

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- Design – Amy Wilson
- Photography – Gerard Walsh & Amy Wilson

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