



“We’re creating tools for a patient-empowerment model of decentralized health care that makes care accessible in rural areas while reducing the costs and environmental impact of care. We envision selling these technologies around the world to generate wealth to sustain our own health care system.”

Dr. Michael Dunbar, orthopedic surgeon, professor of surgery and biomedical engineering, recipient of \$18 million in peer-reviewed grant funding since 2001



Physiotherapists, engineers and surgeons keep osteoarthritis patients on the move



Taking Trial-and-Error Out of Implant Selection

The researchers have found that certain gait and muscle-activation patterns cause some styles of implants to wiggle loose, while allowing other implant styles to remain stable. *“Now we have data that helps us select just the right implant for each patient,”* says Dr. Dunbar. *“This allows long-term pain-free mobility and reduces the need for surgeries to replace failed implants.”*

Physiotherapy professor **Dr. Cheryl Kozey**, biomedical engineer **Dr. Janie Astephen-Wilson** and orthopedic surgeon **Dr. Michael Dunbar** want pain-free mobility for people with osteoarthritis—whether they’re waiting for joint-replacement surgery or approaching their 20th year with joint implants.

“Rising rates of obesity have tripled the demand for knee replacement surgery among middle-aged men and women in the past ten years,” says Dr. Dunbar. *“Yet implants typically last less than 20 years. We must delay the need for surgery and prolong the life of implants so people can stay active. Their health literally depends on it.”*

Drs. Kozey, Astephen-Wilson and Dunbar are finding ways to do both. By studying the gait and leg-muscle activation patterns of hundreds of people over many years, they have identified ways of walking that wear down cartilage and cause osteoarthritis to develop and progress.

“We can target these unique walking patterns with therapeutic exercise and training that can slow down the wear and tear on the joints,” says Dr. Kozey. *“Correcting their walking mechanics allows people to put off joint-replacement surgery—easing the pressure on very long waitlists.”*

The researchers are also pioneering RSA testing (radio-stereometric analysis) to monitor the stability of implants after surgery, so failure-prone implants can be removed from use before they’re placed in thousands of patients. This work has led to substantial commercial activity. A spin-off company, Halifax Biomedical, is developing million-dollar RSA-testing software and equipment suites and selling them to leading health care institutions around the world.

Smart Phones = Smart Follow-up Care

With colleagues in Dalhousie’s School of Biomedical Engineering, the researchers are developing a smart phone app that uses an accelerometer and EMG electrodes to capture and record data about patients’ gait and muscle-activation patterns. *“The app sends the information straight to us and tells us if your implant is likely to remain stable or if you need to come see us,”* says Dr. Dunbar. *“This will save patients unnecessary travel and give surgeons time to focus on the patients who really need to see us.”*

THIS RESEARCH IS...

- cutting wait times for joint-replacement surgery
- giving pain-free mobility into old age for better overall health
- creating new technologies to make care more efficient and accessible
- saving money for the health care system
- creating high-quality jobs
- generating revenue through a Cape Breton-based spin-off company