This was an exciting year for us at Rusk Rehabilitation, with new endeavors aimed at helping patients regain their strength, independence, and quality of life.

This annual report highlights some recent accomplishments as well as complex patient cases with which our faculty and staff members are proud to have been involved.

The new Division of Oncological Rehabilitation at NYU Langone Health is greatly assisting cancer patients in meeting their rehabilitative goals. Rusk’s rehabilitation experts were critical in the remarkable recovery of a heart transplant patient and enabled a young stroke patient to regain her musical abilities. Our involvement in the Traumatic Brain Injury Model Systems program has revealed crucial insights about disparities in patient outcomes.

Looking ahead to the future, we will continue to expand access to rehabilitation medicine, engage in valuable research, and exercise our passion for restoring patients’ abilities.
New Oncological Rehabilitation Division
Optimizes Quality of Life for Cancer Patients

Nearly 18 million Americans are expected to be living with cancer by 2022. Thanks to ongoing therapeutic improvements, more of them will be living longer with the disease. Many patients will face significant functional morbidity due to their cancer, their treatment, or both, and multiple studies suggest that doctors are still struggling to identify and address cancer’s adverse physical and psychological effects. Despite the high need for intervention, most patients are not referred to rehabilitation services for their impairments.

In 2018, Rusk Rehabilitation at NYU Langone Health launched a specialized, highly collaborative program to address the complex rehabilitative needs of individuals with cancer. "Our mission is to improve function and quality of life for all cancer survivors throughout the entire care continuum, from diagnosis through treatment to post-treatment care, remission, and even long-term follow-up," says Jonas M. Sokolof, DO, director of the new Division of Oncological Rehabilitation. Dr. Sokolof came to NYU Langone in 2018 from Memorial Sloan Kettering Cancer Center.

In partnership with medical oncologists, radiation oncologists, surgeons, and nurses at NYU Langone’s Perlmutter Cancer Center as well as with a wide array of other providers, the rehabilitation program can offer individualized care plans for each patient, Dr. Sokolof says. Care may include physical therapy, occupational therapy, osteopathic manipulation, speech-language and swallowing therapy, vocational therapy, psychological services, music and recreational therapy, pain management, social work services, and lifestyle interventions such as nutritional counseling, exercise, and stress management. "Given the broad range of preventive, restorative, supportive, and palliative rehabilitative services, every single cancer patient can benefit from some form of rehabilitation encounter," says Dr. Sokolof.

EMPHASIZING THE ROLE OF EXERCISE

Dr. Sokolof plans to further expand rehabilitation services with a program that emphasizes the role of exercise in cancer survivor health and treatment of the disease. "We want patients to be physically active from the time of diagnosis all the way through the completion of their treatment—and beyond," he says. "There are strong data indicating that exercise can improve quality of life for cancer survivors, improve overall function, decrease fatigue, protect against the disease itself, improve mortality and survival, and reduce the risk of recurrence."

Given the broad range of preventive, restorative, supportive, and palliative rehabilitative services, every single cancer patient can benefit from some form of rehabilitation encounter.”

—Jonas M. Sokolof, DO

One question is how to determine the appropriate level of intervention for each cancer patient. Dr. Sokolof is participating in an American College of Sports Medicine International Multidisciplinary Roundtable on Exercise and Cancer to create new guidelines for prescribing therapeutic exercise. He is also working in conjunction with a group of specialists gathered by the American Congress of Rehabilitation Medicine to create a new model for exercise-focused rehabilitation.

EXPLORING NEW REHABILITATION OPTIONS FOR HEAD AND NECK CANCER PATIENTS

To help bolster the rehabilitative tool kit, Dr. Sokolof and Kenneth S. Hu, MD, associate professor of radiation oncology and otolaryngology—head and neck surgery, are investigating the potential of low-level laser therapy (cold laser therapy) for treating radiation fibrosis and lymphedema in head and neck cancer patients. Dr. Sokolof is also exploring the potential of functional electrical stimulation (e-stim) to help patients with dysphagia, another complication of head and neck cancers. This technique could facilitate laryngeal closure during swallowing through adaptive learning. "Getting these patients swallowing again and off their PEG feeding tubes would be a big breakthrough," says Dr. Sokolof.
The translation of cutting-edge research into advanced clinical care has reopened possibilities for a young patient who suffered an idiopathic stroke. With a multimodal rehabilitation plan encompassing innovative muscle training and music therapy, she has returned to playing the music that drives her quality of life.

In July 2018, the nine-year-old girl was in otherwise good health, attending a summer music camp to hone her skills as a violinist and pianist. After falling ill on the playground, she was rushed to the emergency room, where doctors diagnosed a hemorrhagic stroke with severe right-sided weakness. She was transferred to NYU Langone Health for a neurosurgical evaluation, and even though the patient’s stroke etiology remained unclear, neurosurgeons ruled out the need for surgery. With close monitoring and anti-seizure medication, the girl’s condition stabilized until she could be transferred to inpatient rehabilitative care at Rusk Rehabilitation.

“ar first it was a fight for survival; then it shifted to a fight for what mattered most to her: making music. When I first saw her, she had no movement or sensation in her right side; it was completely limp,” recalls Preeti Raghavan, MD, the Howard A. Rusk Associate Professor of Rehabilitation Research, vice chair for research, and director of the Division of Motor Recovery Research.

For this patient, Dr. Sukhov facilitated the use of the Bimanual Arm Trainer on the inpatient unit. As the girl’s parents used the device with her each day, they noted she began to regain more feeling and movement, which enabled her therapists to advance their work with her during sessions.

**MULTIMODAL REHABILITATIVE CARE YIELDS RAPID RECOVERY**

The team elicited dramatic improvement in one month. “At first, this patient couldn’t move the device with her affected arm or tolerate it for more than ten minutes,” Dr. Raghavan says. “By the time she was discharged, she had independent movement at her affected shoulder and elbow and sensation in her upper arm.” Soon, she began to move her violin bow with the aid of a prosthesis attached to her forearm. The team continued working with the girl as an outpatient, helping her to walk with the aid of a brace and intensive therapy with a Lokomat® body weight–supported treadmill, and using a Hocoma Armeo® device to train her arm movements. However, her muscles were becoming stiff at the wrist and fingers, and she wasn’t able to hold the bow in her hand.

To help relieve the muscle stiffness in the patient’s wrist and fingers, Dr. Raghavan administered the viscosity-decreasing enzyme hyaluronidase as an off-label treatment. The very same day, the patient held her violin bow in her right hand for the first time since her stroke.

Today, the patient continues to rebuild and refine her skills at the violin and piano, and she is knitting with both hands to improve dexterity. “This patient’s remarkable progress since her initial presentation is an example of neuroplasticity and what is possible with advanced rehabilitative care,” says Dr. Raghavan.

**This patient’s remarkable progress since her initial presentation is an example of neuroplasticity and what is possible with advanced rehabilitative care.”**

—Preeti Raghavan, MD

Disclosure: Preeti Raghavan, MD, is co-founder of Mirrored Motion Works, Inc and Movease, Inc. NYU Langone Health has filed a patent on use of hyaluronidase for muscle stiffness. The use of hyaluronidase for muscle stiffness is an off-label clinical treatment.

PATIENT’S PROGRESS

The patient’s rehabilitation plan also included use of an innovative video game device, the Bimanual Arm Trainer. Renat R. Sukhov, MD, clinical associate professor of rehabilitation medicine and interim medical director of the Pediatric Rehabilitation Service, is the principal investigator on a study that provides the Bimanual Arm Trainer to children at home to enable arm training after school hours. Invented by Dr. Raghavan and neuro-physiologist Donald J. Weisz, PhD, the device allows a patient’s arms to make mirrored movements. “With the device, the two arms are connected so the affected arm moves with the unaffected arm. In this way, the patient can get a lot of movement training for the affected arm outside her therapy sessions with very little setup, and the video game keeps the training engaging,” Dr. Raghavan explains.

**EARLY REHABILITATION IS CRITICAL**

The interdisciplinary care team faced a daunting challenge: The dense right-sided hemiplegia had significantly reduced the patient’s prospects of playing the violin again. For such patients, occupational therapy often focuses on compensatory strategies to help the patient independently perform activities of daily living and write with the unaffected hand. The goal of restoring fine motor skills such as playing the piano or violin with both hands can be less realistic. “But we know that the early period is critical, as the brain tries to repair itself, so we gave it our best shot,” Dr. Raghavan says.

**INNOVATIVE APPROACH ACCELERATES PATIENT’S PROGRESS**

The patient’s rehabilitation plan also encompassed innovative muscle training and music therapy, which drives her quality of life. The translation of cutting-edge research into advanced clinical care has reopened possibilities for a young patient who suffered an idiopathic stroke. With a multimodal rehabilitation plan encompassing innovative muscle training and music therapy, she has returned to playing the music that drives her quality of life.
Research suggests that racial and ethnic minorities have less access to healthcare resources after a traumatic brain injury (TBI), including a longer lag time before they receive inpatient rehabilitation. The disparities remain even when the patients are more seriously injured and even after researchers have accounted for socioeconomic status.

The diverse patient population at NYU Langone Health is allowing Tamara Bushnik, FACRM, associate professor of rehabilitation medicine, to study these disparities and differential outcomes in cultural, ethnic, and racial groups. Over the past six years, Dr. Bushnik and collaborators have enrolled nearly 300 patients, primarily from Bellevue, in the Traumatic Brain Injury Model Systems (TBIMS) program. "We’re using the diversity of New York to examine differences in the experience of living with a chronic traumatic brain injury," she says.

Dr. Bushnik and colleagues will use a series of outpatient and community-based interviews to help them develop educational materials and resources tailored to patients with TBI, their caregivers and clinicians, and distinct populations that may experience obstacles to receiving care and services.

**STUDYING TBI’S EFFECT ON MENOPAUSE AND EMOTIONAL PROCESSING**

As part of developing the TBIMS program, Dr. Bushnik’s team is participating in two multicenter module projects that are tapping into the national database. One project, led by the Detroit Medical Center Rehabilitation Institute of Michigan, is studying menopause in women who have had a moderate to severe TBI. Researchers will use an online survey to ask a cohort of perimenopausal and menopausal women with TBI about their symptoms and experiences and compare the responses with those of age-matched men and women who have not had a TBI. "TBI could exacerbate or change menopause symptoms, or menopause could exacerbate TBI symptoms," Dr. Bushnik says.

The other project, led by Indiana University, is investigating the possible contribution of TBI to alexithymia, in which altered emotional processing leads to an inability to recognize one’s own or others’ emotions. Although alexithymia has been widely documented, few outpatient rehabilitation programs have specifically addressed the phenomenon. For participants in the TBIMS program, Dr. Bushnik’s team and the project collaborators are administering a questionnaire designed to help diagnose alexithymia’s severity.

"We want to see how having alexithymia may or may not affect a patient’s outcome at year 1 and year 2 after a traumatic brain injury," she says. Negative effects could be due to a lack of community integration, an inability to carry out the TBI rehabilitation with family and friends, or other factors. To provide a more complete view of the consequences of the injury, the team will interview each patient’s primary caregiver or significant other to get their perception of how the patient’s emotional processing has changed and how the alexithymia may have affected them as well.
New Research Helps Stroke Patient Overcome Eye-Hand Incoordination

Independent of other eye and hand challenges, many stroke patients have impaired eye-hand coordination that goes beyond what would be expected from underlying unidimensional sensorimotor deficits, such as hemiparesis. The lab of John-Ross Rizzo, MD, MSCI, assistant professor of rehabilitation medicine and neurology, was instrumental in discovering the phenomenon while studying patients’ accuracy when reaching for objects.

Since then, Dr. Rizzo and colleagues have sought to better understand the individual components of eye-hand control. “We want to know what they mean for a stroke patient in terms of neural processing and what demands they impose on an injured brain,” Dr. Rizzo says. “There is a primary problem where you mistime the two movements, and then there is the associated spatial challenge, that is, where you’re landing in the space both for the gaze and for the limb.”

To help stroke patients overcome this impairment, Dr. Rizzo’s lab is developing a type of biofeedback that provides them with visuospatial cues in real time. The technology, which resembles a video game, uses computer prompts as a patient looks at an object across a table and reaches for it. Precise measurements can detect when the person’s visual system is off target, meaning his or her gaze is not aligned with the center of the target, and biofeedback on eye movement errors can indicate the extent of the inaccuracy on a trial-to-trial basis. “What if we actually gave you eye movement error feedback and it could serve as a spatial guidance system for error correction, cueing you to pay attention to your eye movements?” he asks.

To find out, Dr. Rizzo’s team tested its feedback system on a dozen stroke patients. “Not only does the system reduce spatial errors in their reaching limb, but it actually improves the eye-hand coordination impairment,” Dr. Rizzo says. “It helps patients resynchronize those two movements.” The improvement, he says, starts to approach the way healthy volunteers perform the task. The research, presented at an international eye movement conference in Italy in 2018, will be written up in the journal *Progress in Brain Research.*

“Not only does this system reduce spatial errors in their reaching limb, but it actually improves the eye-hand coordination impairment.”
—John-Ross Rizzo, MD, MSCI

John-Ross Rizzo, MD, MSCI, Awarded Deborah L. Wilkerson Early Career Award

In more than a dozen publications over the past year, John-Ross Rizzo, MD, MSCI, has reported on advances in research areas ranging from stroke rehabilitation and concussion biomarkers to technology that aids in visual impairment. In recognition of Dr. Rizzo’s many contributions, the American Congress of Rehabilitation Medicine honored him with the 2018 Deborah L. Wilkerson Early Career Award.

John-Ross Rizzo, MD, MSCI, and Todd Hudson, PhD
New Research Helps Stroke Patient Overcome Eye-Hand Incoordination

Using a prototype book bag-like device outfitted with sensors and computers, Dr. Rizzo simulated how the new technology can act like a digital power tool or a cognitive orthotic and empower a visually impaired person on a trip through a grocery store. Similar technology being developed by Dr. Rizzo’s lab in partnership with the NYU Tandon School of Engineering, called Cross-Safe, can detect when a stoplight is red or green to help people safely cross an intersection. (Although audible pedestrian signals are becoming more widespread, their installation has nevertheless been extremely slow.) Cross-Safe technology already accurately detects and recognizes 96 percent of red/green light pedestrian signals across New York City, greatly improving accessibility.

In a featured talk at the 8th Annual TEDxNYU Conference in 2018, Dr. Rizzo shared his vision of a future in which new tools help people overcome their visual disabilities. Dr. Rizzo, who is legally blind, often relies on a hand-squeeze code with his wife to help him detect and navigate environmental hazards. Combining his personal experience with his expertise, he is working to develop advanced wearable technology that incorporates belt-based touch codes and audio headsets to provide ultrasensitive navigational aids to others who are visually impaired.

Aerobic Exercise Plays a Critical Role in Rehabilitation After Stroke and Heart Transplant

Traditional rehabilitation models often do not incorporate aerobic exercise as a core component. Jonathan H. Whiteson, MD, associate professor of rehabilitation medicine and vice chair for clinical operations, believes the models that do include aerobic exercise can yield dramatic improvements, even in highly complex cases.
Complex Case: Aerobic Exercise Plays A Critical Role in Patient’s Rehabilitation After Stroke and Heart Transplant

For one such case, doctors at NYU Langone Health initially diagnosed a 32-year-old woman with viral cardiomyopathy. Her deteriorating condition led to heart failure, and doctors listed her for a heart transplant. In the interim, cardiologists implanted a defibrillator and a left ventricular assist device (LVAD), but her case was further complicated by a significant right middle cerebral artery (MCA) stroke prior to her transplant.

Rusk Rehabilitation was involved with her inpatient care every step of the way, including providing bedside physical and occupational therapy to help her gain strength prior to the LVAD placement. In April 2018, after the patient’s post-stroke condition had stabilized, In April 2018, after the patient's LVAD strength prior to the LVAD placement. Dr. Whiteson says, “She did so well that she was able to continue her rehabilitation as an outpatient.”

Discharged in September 2018, the patient is continuing in Rusk’s outpatient cardiac rehabilitation program to fully regain her strength and cognitive abilities, and has markedly improved her physical aerobic conditioning and endurance on a bicycle, a treadmill, and other aerobic machines. Dr. Whiteson says the patient has done so well that she is now considered independent and ready to resume a normal life.

In particular, though, the patient made significant strides in her cognitive, focal, and generalized weakness through daily aerobic exercise, which was gradually increased in both duration and intensity. Dr. Whiteson says, “There’s a growing amount of evidence that from a cellular level to an organ system/physiological level, aerobic exercise is a key to a patient’s rehabilitation and may make a tremendous difference in the course of disease.”

—Jonathan H. Whiteson, MD

ENGAGING REHABILITATION PATIENTS FOR LONG-TERM RECOVERY

Dr. Whiteson says the inpatient referral to Rusk played a major role in the patient’s impressive recovery. The heart transplant had left her with generalized weakness, in addition to her left-sided weakness from the stroke and mild to moderate confusion and agitation. Cardiac rehabilitation improved her general weakness, and stroke rehabilitation improved her left-sided strength and coordination. She also received cognitive rehabilitation through psychological, speech, occupational, and physical therapy.

This exercise regimen can do far more than strengthen weak muscles and improve endurance after a disease or injury. Dr. Whiteson says, “At a neurochemical level and a cellular level, aerobic exercise enhances the traditional rehabilitation recovery rate,” he says. It also provides significant cognitive benefits. Accordingly, he and colleagues are working to expand the role of aerobic exercise, not just in cardiac and pulmonary rehabilitation, but in rehabilitation across the disease spectrum. “There’s a growing amount of evidence that from a cellular level to an organ system/physiological level, aerobic exercise is key to a patient’s rehabilitation and may make a tremendous difference in the course of disease: in cancer, in brain injury, in stroke, and so on,” he says.

Establishing an Aerobic Exercise Research Community

With the 2018 American Academy of Physical Medicine and Rehabilitation Annual Assembly as a springboard, Dr. Whiteson has begun creating a research community to study the role and value of aerobic exercise in recovery and rehabilitation. Concurrently, Rusk’s National Advocacy and Program Innovation Committee is helping to identify, research, and harness innovative technology and health interventions to further develop the cardiac rehabilitation program.

Ana M. Molina, PhD, RN, clinical assistant professor of rehabilitation medicine, is president-elect of the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR). To aid the committee’s goal of improving referral rates for cardiac rehabilitation, Dr. Molina, Dr. Whiteson, and Gregory J. Sweeney, DPT, clinical instructor of rehabilitation medicine, have contributed to a national initiative led by the Centers for Disease Control and Prevention (CDC) and the AACVPR: The Cardiac Rehabilitation Change Package, called Million Hearts, has set a goal of preventing 1 million cardiac events by 2021 through enhanced referral to cardiac rehabilitation. Dr. Whiteson says one key to attaining that goal is educating potential referring physicians, such as cardiologists and primary care doctors, about evidence that shows that cardiac rehabilitation reduces readmission rates, recurrent cardiac events, healthcare expenditures, and the death rate among cardiac disease patients. The initiative will also create an automatic referral system embedded in electronic health records, in which a heart attack, transplant, or other qualifying diagnosis will trigger a default referral to cardiac rehabilitation.
A long-standing aim of Rusk Rehabilitation physiatrists has been to heighten public awareness about limb loss and dispel the myth that amputees have diminished potential. At a private event, actor Dwayne “The Rock” Johnson helped deliver that message during a surprise visit to Rusk patients and their families after a private screening of his summer blockbuster, Skyscraper.

In the movie, Johnson plays a former special operations agent whose lower leg was amputated after an injury in the line of duty. Guests for the screening included current and former Rusk Rehabilitation patients, members of Rusk’s Learning and Encouragement for Amputees with and without Prosthetics (LEAP!) support group, and members of the New York City chapter of Achilles International, which includes athletes with disabilities.

Dr. Flanagan, as well as Jeffrey M. Cohen, MD, clinical professor of rehabilitation medicine and medical director of Medically Complex Rehabilitation Service, spoke briefly. Dr. Cohen thanked Johnson for the movie and for coming to the event. “Amputee awareness is something we’ve been advocating for years, and this movie will do a lot for that,” he said. “It’s the first blockbuster action movie to have an amputee as the lead character.”

Dr. Flanagan said the movie offered a “great opportunity” to depict someone who has lost a limb as a hero. “But the true heroes tonight are here in this room,” he told audience members. “You show me every single day all the abilities you have.”
Awards & Recognition

Awards

Christopher L. Kyriakides, DO, instructor of rehabilitation medicine, received the NYC Health + Hospitals Doctors Day Award for his work at NYC Health + Hospitals/Gouverneur.

Sonya Kim, PhD, research assistant professor of rehabilitation medicine, received the Women in Neurodegenerative Disease Rehabilitation Science Award from the American Congress of Rehabilitation Medicine (ACRM).

Jonathan H. Whiteson, MD, associate professor of rehabilitation medicine, received NYC Langone’s Marion Frauenthal Slonim Clinical Research Award.

Promotions

Preeti Raghavan, MD, was appointed the Howard A. Rusk Associate Professor of Rehabilitation Research.

Jonathan H. Whiteson, MD, was promoted to associate professor, rehabilitation medicine.

NYU Langone Health

Tuition-Free Initiative Addresses High Student Debt

NYU School of Medicine announced in August 2018 that it will begin offering full-tuition scholarships to all current and future students in its MD degree program regardless of need or merit—a bold effort to simultaneously address the rising costs of medical education and still attract the best and brightest students to careers in medicine. “This decision recognizes a moral imperative that must be addressed, as institutions place an increasing debt burden on young people who aspire to become physicians,” says Robert I. Grossman, MD, the Saul J. Farber Dean of NYU School of Medicine and CEO of NYU Langone Health.

Visit med.nyu.edu/school for more information.

NYU Langone Health

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Rusk Rehabilitation 5th Annual Research Symposium

May 28, 2019 at 12:00 pm

Join us for a day of poster sessions, technical exhibits, and lectures on advances being made at Rusk.

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ANNOUNCING

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in U.S. News & World Report’s “Best Hospitals”
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