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MSKNews

MEMORIAL SLOAN KETTERING CANCER CENTER

Moving Forward After Cancer

Charles, a glassblower, is getting back to making art.

ALSO INSIDE

Coping With Fear
How I Live Now
What Cancer Cells Eat
Developing New Drugs

Memorial Sloan Kettering Cancer Center

Dear MSK Community,

It's remarkable that more people are surviving cancer today than at any point in human history.

By 2040, we expect that there will be more than 26 million cancer survivors in the United States alone and that 7 in 10 people diagnosed with cancer will be alive five years later. These aren't just statistics — they represent millions of individual triumphs, families kept whole, and futures reclaimed.

Cancer is increasingly a chronic illness that can be managed, allowing people to return to the lives they want to live. This is extraordinary progress, and it fills me with hope.

Yet I also know that even when someone is declared "cancer free," their life is forever changed.

When the intense regimen of treatments and appointments finally ends, a different journey begins. Patients must process what they've endured and navigate an uncertain path forward. Paradoxically, this transition into "survivorship" can bring its own anxiety. The care team who carried you through your darkest hours — with whom you may have forged deep bonds — now explains that continued visits aren't medically necessary. It's natural to feel anxious in that moment.

But you are not alone.

Our survivorship programs exist precisely for this reason. These teams specialize in managing the long-term physical and emotional effects of cancer. They understand the fear of recurrence and know how to help you cope.

In this issue of *MSK News*, you'll encounter powerful stories from people who have survived cancer and discovered how to move forward. They offer honest reflections on adjusting to a new normal. Their journeys aren't easy, but they prove what's possible.

This issue also celebrates the kind of groundbreaking laboratory research that leads to new cancer treatments and better survival for more people.

You'll learn how MSK has become a powerhouse for drug development, including our work on lung cancer therapies, continually refining them to reduce side effects and outmaneuver cancer's resistance.

You'll meet the scientists who are studying cancer cell metabolism and exploring how depriving cancer cells of fuel can stop them.

And you'll hear from our new Chief Scientific Officer, Dr. Ross Levine, whose conviction that we're living in the golden age of cancer research offers tremendous reason for optimism.

The future Dr. Levine envisions — one in which far more people survive cancer and go on to live better and longer — is the future we're building together every single day.

With gratitude and determination,

Selwyn M. Vickers, MD, FACS
President and Chief Executive Officer

MSKNews

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To learn how the MSK Giving community is supporting a better future for cancer care, scan the QR code.

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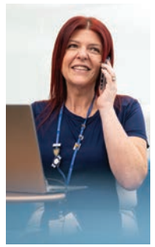

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Get the latest news from MSK about cancer care, research, and healthy living.

FINDING JOY *Again*

How a New MSK Treatment for Tongue Cancer Saved an Artist's Life and Work

When he's at work in his glassblowing studio, Charles Provenzano loses all track of time.

"I could be going for eight hours, and it feels like I just started," says Charles, 72, who has trained with some of Italy's most renowned glassblowers. "It's like with concert pianists — you study an art so much, you get better, and it becomes you. That's where the joy is."

But when a painful lump on his tongue turned out to be cancer, Charles feared that he might have to give up "a love of my life."

Thanks to a new approach for treating tongue cancer at Memorial Sloan Kettering Cancer Center (MSK), Charles is still able to practice his art and find joy in it. Standard treatment for tongue cancer can include removal of part or all of the tongue, as well as radiation, all of which can have a dramatic impact on a person's ability to eat, swallow, and speak.

She's the One: Choosing MSK for Tongue Cancer Treatment

When Charles came to MSK in October 2023, he met first with head and neck surgeon Jennifer Cracchiolo, MD, whose confidence and expertise made him feel comfortable right away. Charles took his daughter, Lucia, to the visit. She had studied neuroscience in college, and Charles valued her opinion.

"Dr. Cracchiolo came in completely focused on the case," Charles says. "When she stepped out of the office for a moment, Lucia looked at me and said, 'She's the one.' "

Many people with cancers of the head and neck worry about the side effects of treatment. Dr. Cracchiolo explained to Charles that the removal of the tumor might mean taking out over half of his tongue in a procedure called a "hemiglossectomy." The surgeons would then rebuild his tongue using a different procedure called a "free flap reconstruction."

Recovery would be difficult. Charles might have a hard time speaking and swallowing, and he would likely need rehabilitation therapy.

"I had been a bit in denial about how serious it was," Charles says. "It wasn't until later I realized how extreme the outcome could be if I had that procedure."

A Clinical Trial To Minimize Surgery and Avoid Radiation

Dr. Cracchiolo called Charles the next day with good news: He was a promising candidate for a clinical trial led by MSK head and neck medical oncologist Lara Dunn, MD. Dr. Dunn is a leader in multiple trials testing targeted therapy, immunotherapy, and new combinations of agents for head and neck cancers.

This clinical trial, available only at MSK, seeks to minimize surgery and potentially remove the need for radiation.

Dr. Dunn presented promising early results from the trial at the 2023 meeting of the American Society of Clinical Oncology (ASCO). She reported the approach worked well to reduce the size and extent of tumors. People in the trial had less complex surgery that preserved more of the tongue.

When Charles learned the trial was ongoing and that he could enroll, he didn't hesitate: "I said, 'Just sign me up right now.'"

The trial involved giving a drug combination before surgery — an approach known as neoadjuvant therapy — in hopes of shrinking the tumor first. When Charles met with Dr. Dunn, she explained he would receive a four-drug combination:

- Two chemotherapy drugs (cisplatin, carboplatin, or docetaxel)
- A medication that targets a protein called EGFR (cetuximab)
- An immunotherapy drug known as a checkpoint inhibitor (cemiplimab)

Resounding Success: Tongue Tumor Shrank by 90%

Charles had the powerful treatment over the next few months. Dr. Dunn warned him it would be hard, and it did take a toll. He lost weight and energy.

"It was intense," Charles says. "But I thought it was worth it, mainly because I wanted to avoid the radiation."

Eventually, the pain in his tongue started to ease. He slowly began to feel better.

Most importantly, the tumor on his tongue shrank to less than 10% of its original size.

By February 2024, Dr. Cracchiolo could remove the tumor while saving most of his tongue. She also took out lymph nodes from his neck to be sure the cancer had not spread.

Charles did not need reconstructive surgery or follow-up radiation.

"This was a huge win," says Dr. Dunn. "In the short term, Charles avoided major surgery and reconstruction. In the long term, he didn't sacrifice a good quality of life."

Charles Provenzano worried that having extensive surgery for tongue cancer would threaten his ability to continue glassblowing. But the treatment he received through a clinical trial at MSK shrank his tumor dramatically, which made it easier to remove and allowed him to avoid radiation treatment.

Charles says glassblowing is so absorbing that he loses all track of time. “It’s like with concert pianists — you study an art so much, you get better, and it becomes you. That’s where the joy is.”

Head and neck medical oncologist Dr. Lara Dunn, with nurse practitioner Yingzhi Wu, led the trial that aimed to minimize surgery and reduce treatment.

“Radiation can cause mouth sores, trouble swallowing, loss of taste, and even injure the jawbone,” she adds. “Thanks to the neoadjuvant therapy, Charles was able to avoid all that.”

Charles says recovery from surgery went fast. In two days, he could eat soft food and go home from the hospital.

“I felt comfortable the entire time I was at MSK from the moment I walked in the door, because of the atmosphere and the way they treat you,” he says. “It’s very professional and empathetic. They really take care of everything you need.”

The hardest part of his treatment was chemotherapy and immunotherapy, but Charles says he is glad he chose to join the clinical trial. He has had only minor lasting side effects. They included feeling numb in his neck and on one side of his tongue. He also had lichen planus, a common reaction to immunotherapy that causes chronic inflammation on the tongue. Charles says the condition comes and goes but has not affected his eating.

Back to His Beloved Glassblowing Studio

Almost two years after treatment, Charles feels well and continues his passion for glassblowing, both as an artist and teacher.

He also runs his own jewelry store, does ceramics, and loves to travel — last year, he spent three weeks in Japan. His life is full.

“I feel very lucky,” says Charles. “Not only did I survive cancer, but I’m also enjoying my health, my family, and my art.”

“For people in my situation, I urge them to stay strong and just get through it, and never lose hope things will turn out well,” Charles says. “Thanks to the amazing doctors and staff at MSK, the outcome was even better than everyone expected.” •

Head and neck surgeon Dr. Jennifer Cracchiolo suggested Charles join a clinical trial that ultimately enabled him to have a much less invasive operation.

Dr. Cracchiolo’s research is supported by the MSK donor community, including James A. Gabriele.

Life After Cancer: What Survivorship Care Really Means

When you've been through cancer treatment, hearing the words "you're cancer free" should feel like the finish line. But for many patients, it's the beginning of a new and sometimes uncertain chapter. That's where survivorship care comes in — and it is more important than you may think.

What Is Survivorship Care?

"Survivorship is a phase of care that should really begin from day one," says nurse practitioner Jessica DiVanno, who leads MSK's survivorship program. "It's not just about screening for recurrence — it's about whole-person care, promoting good health overall, and managing long-term side effects."

The transition to survivorship happens when your risk of recurrence is very low, and you've met specific guidelines for your type of cancer. And here's something many people don't realize: You can be in cancer survivorship even if you're taking medication long-term.

What Makes Survivorship Care Different?

So why not just continue seeing your oncologist? Because survivorship providers are specialists in this unique phase of care.

"We have the clinical training to detect a recurrence, so patients can feel assured," says DiVanno. "But our approach is different. We help patients adjust to how their lives may have changed, and we're really specialized in managing any long-term side effects of treatment."

Appointments during this phase of your care may focus on things that might not have been priorities during active treatment, such as:

- **Physical side effects**: Issues like lymphedema (tissue swelling), fatigue, and sleep problems get dedicated attention. "We validate that what you're experiencing is common and help you find ways to manage," says DiVanno.
- **Sexual health**: These conversations often get overlooked but are crucial to quality of life.
- **Mental health**: The emotional adjustment to life after cancer deserves support.
- **Overall wellness**: From nutrition and exercise to stress management, survivorship care looks at the big picture.

A Team Approach to Your New Normal

Survivorship providers work closely with other services to give you comprehensive support. They frequently refer patients to Integrative Medicine for services like acupuncture, meditation, sleep therapy, and the About Herbs database — an internationally recognized resource for cancer patients that provides information on the risks and benefits of herbs, vitamins, and supplements.

MSK also has special programs for adult survivors of childhood cancers.

Eventually, some patients can even transition to having their primary care doctor manage their follow-up care with guidance from the survivorship team.

The Bottom Line

"Patients really do love our survivorship program," DiVanno says. "It's a place where they can feel heard and start to move forward with confidence. Getting this level of care after treatment is unique to MSK."

For more information about MSK's survivorship programs, visit mskcc.org. Search for your cancer type and you'll find a list of resources available to you.

Jessica DiVanno is a nurse with advanced training who leads MSK's survivorship program, helping patients transition to a new phase of care.

A Fraternal Force for Good

Eddie Baynes

Eddie was diagnosed with stage 2 prostate cancer in 2024 and was treated by urologic surgeon Behfar Ehdaie, MD, MPH. He has become an advocate for prostate cancer awareness in the Black community.

When I was diagnosed, my biggest fear was the long-term effect of surgery. I wanted to avoid it at all costs.

Then MSK connected me with Michael, another Black man around my age, who had prostate cancer surgery from Dr. Ehdaie. Michael explained how MSK sexual health experts would work with me before and after the operation. He said, "They're going to look after you, and if your sexual function isn't coming back, they have a lot of options they can offer." Talking to him made me feel much better about the path forward.

Throughout my cancer treatment and afterward at MSK, I learned I could do things to improve my outcome. Urologic surgeon Jose Flores, MD, who specializes in preserving sexual and urinary function, had me taking Cialis and doing Kegel exercises to strengthen my pelvic muscles even before surgery.

Since the operation, I have resumed the life I had before cancer, with a few differences. I can no longer ejaculate (it's now a dry orgasm), but my erectile function is back to about 80% of what it was before. I take a low dose of Cialis every day to help with that. My bladder function is good. I sometimes leak from urinary incontinence when I'm stressed or exercising, but I wear liners to minimize it. I continued the Kegel exercises after the surgery, and I can tell the difference it makes if I take a break. It's nice to have a sense of control. I'm very active and strong. I'm back to running five miles several times a week.

Prostate cancer screening saved my life. Now I am constantly speaking to men about its importance. I led the charge for everyone in my fraternity, Alpha Phi Alpha, to get their PSA checked and call me with their PSA number. About 80% did! This spring, I participated in my first Cycle for Survival to raise money for cancer research.

I want men to know they can take control. Advocate for yourself and then for others. That's how you fight fear.

Eddie Baynes, with his surgeon Dr. Behfar Ehdaie, has become a strong advocate for prostate cancer awareness and the importance of screening.

Moving Forward by Giving Back

Nisha Falcigno

Nisha was diagnosed with stage 3 rectal cancer in 2014 and treated by colorectal surgeon Garrett Nash, MD, and oncologist Anna Varghese, MD. She has been cancer free since 2023 and volunteers weekly visiting MSK patients in the hospital.

When I walk into a patient's room with Rosalia, my volunteering partner, they are usually in bed with a lot of tubes, feeling lonely or afraid, and we tell them we were once in their position. I had a 28-day stay in the hospital, and things were not looking good for me. I had a daughter who was 17 years old, so I also know what it's like to leave a child at home.

I think patients and their loved ones see: Here's a person who seems to be thriving after cancer, and that could be us too.

I try never to use tentative words. Instead I say: "You will survive. You should plan that trip. You are gonna be living your life for many years to come."

I say it with the confidence and hope that they get something out of it, even if I don't know it for sure. We can't live like we're going to die. What's important is how you live your life as you are today.

As I was being treated for cancer, I was also losing my vision from a different disease. I would ask myself, "Why? There must be a reason." I needed to answer "why" by finding my purpose — and that's why I volunteer.

My daughter tells me that losing my vision has given me a superpower. I listen to someone's voice and can tell how they're feeling and what they need at that moment. Last week, I walked into a patient's room. She'd just had a hysterectomy. I stood close to her, and at one point, she reached out to hold my hand. She didn't tell me she wanted to, but I sensed that was where the conversation was going. It was a beautiful moment for both of us.

I tell people if you're lucky enough to survive cancer, take that gift and pay it forward.

Giving back is so rewarding. You did the hard work to survive. See how you can help your fellow human beings. You can hold the door for somebody else someday.

Nisha Falcigno (at left) volunteers once a week visiting patients in the hospital along with fellow colorectal cancer survivor Rosalia Cassar.

Sundas Hashmi calls Central Park her "sanctuary" — in survivorship, her focus has shifted to finding joy in family and nature.

Savoring Simple Things

Sundas Hashmi

Sundas was diagnosed with oligodendroglioma (brain tumor) at age 37, in 2020, when her children were 2 and 6. Following surgery, she takes vorasidenib (Voranigo®) under the care of oncologist Ingo Mellinghoff, MD.

In some ways, I'm lucky because my brain tumor is low-grade. When I was a teenager, my brother died from glioblastoma, a much worse brain cancer. But I've still had to adapt in many ways to a mind that feels different from the one I knew.

Before diagnosis, I was director of economic research at a family investment office. I have degrees in engineering and economics and always took pride in my problem-solving skills. Suddenly I could not manage even basic tasks, which really hurt my self-esteem. If my mind no longer worked how it used to, was I still me?

But I've learned ways to cope. My short-term memory is poor, so I make constant checklists. I always keep my water bottle, wallet, and keys on a shelf by the front door so I don't forget them. I take daily naps. If I lose my balance or forget the name of a friend I've known for decades, I've learned to laugh it off. My cognition has slowly come back — maybe 80% of what it used to be — but I know I can't go back to my life before surgery and must adjust to my new normal.

My focus has shifted to finding joy in simple things like family and nature. I enjoy making brownies with my daughter and playing squash with my son. Central Park has become my sanctuary. I love, love, love my daily walks there. I recently took up birding, and I've learned so much about our avian friends, including blue jays, cardinals, warblers, and hummingbirds. At night, when my brain is fried, I watch a lot of TV, which I find super relaxing. My daughter and I watch Pakistani dramas, and she's learned some Urdu.

Like many Pakistani immigrants, I used to bury my emotions. When my brother passed away, my parents were very tight-lipped about it. But with the help of my therapist, I've become more comfortable talking about my sadness about my brother and the uncertainty of my life. I also work with a nonprofit, Our Brain Bank, that helps people with brain tumors. I now feel a responsibility to be more open about my challenges because it eases my own suffering and may also help others with theirs. •

WHY
Am I Still Afraid?

Coping With Fear After Surviving Cancer

From the first panicky feelings that something might be seriously wrong, through the uncertainty of waiting for a diagnosis, to the dread about the possible side effects of treatment, and of course the worry about survival, fear is not just one of the first emotions to follow a cancer diagnosis but also one of the most enduring.

The scariest part of the journey may come, unexpectedly, after you've completed treatment. You may live in fear that the cancer will return. Every lump, bump, headache, or cough may seem like a cause for worry. Follow-up appointments and scans, as well as "anniversaries" related to cancer diagnosis and treatment, can be especially triggering for some cancer survivors.

Ironically, the transition to a survivorship program can stir up more anxiety. On the bright side, the shift to survivorship means you may not be coming in to see your oncologist as often. But that can also be hard because their support got you through the most difficult time in your life. In some cases, you might even switch to different specialists for careful monitoring.

"After you have completed treatment, the possibility that cancer could come back is always going to be at the back of your mind," says William Pirl, MD, MPH, Chair of the Department of Psychiatry and Behavioral Sciences at Memorial Sloan Kettering Cancer Center (MSK). "One of my goals is to help patients accept that those fears may come at times and to develop ways to cope with them, so they are able to move forward."

Forever Changed by Cancer

Many cancer survivors expect that everything will go back to the way it was before.

"Everyone is congratulating you and telling you that you should be really happy," Dr. Pirl says. "But although you may be relieved that things did not turn out worse, that doesn't necessarily mean that you're going to be feeling joyful."

Feeling bad about feeling bad is also normal. "Compounding the anxiety and fear around the cancer itself, people often have feelings of regret and sadness that they are not able to go back to their 'regular' lives as easily or quickly as they think they should," Dr. Pirl adds. "They blame themselves for not feeling better."

Those feelings are common, and it may take more time to recover from cancer treatment than people expect, he says.

How a Cancer Survivor and MSK Nurse Manages Her Fear

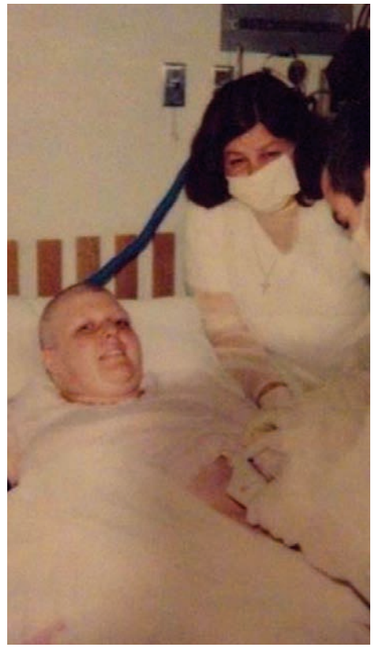
Lauren Kidd, MSN, RN, OCN, calls herself a "Sloan-Grown Nurse." She's spent her entire career at MSK. She is also a three-time cancer survivor who shares her personal experience to help other cancer survivors cope with their fears.

"Like most people who have been treated for cancer, I have fears about cancer coming back," Kidd says. "I'm also afraid of developing other long-term complications related to my cancer treatments. But I try to harness those fears and use them to advocate for myself."

Her experiences also inform the way she treats her patients. "I want them to have the best experience possible, and to care for them just like my MSK nurses cared for me," she says. She currently coordinates care for MSK patients who have been admitted to other hospitals.

Kidd, now 38, has lived through the fear of cancer in many forms. Her mother was a survivor of childhood Hodgkin lymphoma and was later diagnosed with additional cancers and other long-term health problems caused by her treatment decades earlier. (Newer treatments are less likely to cause long-term side effects, including additional cancers.)

Then Kidd herself was diagnosed with Hodgkin lymphoma the summer before she started high school. Less than a year after completing her treatment, she learned she had another cancer — myelodysplastic syndrome, a blood cancer that sometimes



Lauren Kidd as a teenager, when she was going through cancer treatment

Kidd with Frank, who donated stem cells to her after she was diagnosed with myelodysplastic syndrome. He was a stranger at the time, but they have become close friends.

Today, Kidd works as a nurse who coordinates care for MSK patients who have been admitted to other hospitals.

Many cancer survivors expect that everything will go back to the way it was before, but feelings of fear are normal.

occurs after chemotherapy. She needed a stem cell transplant.

Remarkably, Kidd remembers, "Throughout that whole time, I didn't have a lot of fear. I was a teenager, and I felt like I had a cloak of invincibility protecting me. I had no doubt I was going to get through it." But her mindset changed when 20 years later, in the fall of 2023, she was diagnosed with thyroid cancer — her third type of cancer. By then, she had been a nurse at MSK for 15 years and knew a lot more, and she had recently lost her mother to long-term complications of cancer treatment.

"At that point, I definitely felt fear," Kidd says. "I also felt a lot of anger about why this was happening to me again. One thing that helped me get over it was putting trust in my medical team." Kidd says that because she knew she would always be carefully monitored at MSK, she could focus on moving forward and living her life. •

Dr. William Pirl was recently named Chair of MSK's Department of Psychiatry and Behavioral Sciences.

Tips for Managing Anxiety After Treatment Ends

From MSK psychiatrist Dr. William Pirl and Lauren Kidd, MSK nurse and three-time cancer survivor

1 Don't believe everything you read online.

"Research can help you feel more empowered and less fearful, but you should take everything you find online with a grain of salt," Kidd says. "Sometimes it's just someone venting on social media. Trust your medical team and reliable medical sources like MSK over strangers on the internet."

2 Talk to a professional.

"Asking for help from a psychiatrist or therapist doesn't mean you're crazy," Dr. Pirl says. "Having intense feelings around a serious illness is a normal human response, and you don't have to manage these feelings on your own. Some cancer survivors may want regular therapy, but for others, one or two appointments to talk things through may be enough."

3 Consider taking medication.

"Meditation and mindfulness can work great for some people, but for others it's not enough," Dr. Pirl says. "Needing medication is not a sign of failure." Kidd says she keeps medication on hand and takes it to ease her anxiety before scans.

4 Know your triggers and prepare.

If you're prone to "scanxiety," there are ways to cope. It helps to distract yourself from stressful appointments or milestones by planning something you enjoy. "I also tell my patients not to plan anything demanding during these times, like moving or starting a new job," Dr. Pirl says.

5 Create a "cancer resume."

Many survivors need regular follow-up testing to look for cancer or manage long-term side effects. They dread seeing a new doctor and having to relive their medical history. Kidd created a "cancer resume," which has all of her information in one place. "Being organized lets me feel like I'm more in control about what I should be doing to stay on top of my health," she says.

6 Surround yourself with a support team.

Kidd always takes a friend or family member with her to appointments in case she has to face unexpected bad news. If no one can attend in person, you can include someone on a video call or over speakerphone.

7 Be honest about your feelings.

"Rather than letting your mind fill in the blanks with worst-case scenarios, talk to your doctors and nurses about what you're feeling," Dr. Pirl says. "They are there to support you and help ease your fears."

Studying What Cancer Cells Eat

Dr. Lydia Finley (at right) works in the lab with research fellow Dr. Julia Brenner. The Finley Lab studies cell metabolism — that is, what cells eat — to find new strategies against cancer.

At its most fundamental level, cancer is a disease of cells doing things they're not supposed to do, says Memorial Sloan Kettering Cancer Center (MSK) biologist Lydia Finley, PhD.

Cancer cells keep multiplying when they shouldn't. They ignore normal signals to cease and desist. They remake their local environment to suit their needs and protect themselves from attack by the immune system. They travel to new parts of the body. They spontaneously develop resistance to the medicines we attack them with.

"To understand what happens in cancer, we first have to understand how normal cells are supposed to function and what makes things go wrong," says Dr. Finley, an associate member of the Cell Biology Program at MSK's Sloan Kettering Institute.

That's why MSK, which is known for its world-class patient care and advanced clinical trials, also has dozens of research laboratories working on answers to fundamental questions in human biology. Together, they generate insights that will ultimately shape how we understand and treat cancer (and other diseases).

"Many of the drugs we use against cancer target fundamental processes in cells that have gone haywire — affecting how they function, how they grow, how they stay alive," Dr. Finley says. "So we have to know, in great detail, how these processes work if we want to develop new therapies."

Her lab's research focuses on cell metabolism — that is, how cells convert nutrients into the various molecules that they need to function.

"In simple terms, it's how cells use food to grow," she says. "And without access to the right food, cancer cells won't be able to survive."

Rewriting Textbook Biology

Even when a research question doesn't point straight to a new treatment, this type of science is vital: It can uncover new drug targets, telltale markers of disease, and unexpected connections.

"Some people might ask, 'Why not just study cancer?' " says Tobias Walther, PhD, Chair of the Cell Biology Program, who studies how cells manage and store fats — and how failures in those systems contribute to cancer, metabolic disease, and neurodegeneration. "But there's still a lot we don't know about human biology. And we won't know what will unlock powerful new treatments until we ask the questions."

One discovery from Dr. Finley's lab is rewriting textbook biology. Scientists have long understood that the Krebs cycle, also known as the tricarboxylic acid (TCA) cycle, is responsible for how cells burn sugars to make energy. But Dr. Finley and her colleagues found that cells have other ways to make the energy they need to survive.

While we understand the basic road map for how cells use fuel, she says, "we are learning that not all those roads are accessible at all times and in all contexts. We also found that there were routes we didn't know anything about."

The lab's continuing research has led Dr. Finley to believe that all of this may be very important in cancer.

Teaming Up With Clinicians To Tackle a Rare Childhood Cancer

At MSK, scientists and clinicians often team up on research projects in ways that would be difficult at a hospital without a strong laboratory science enterprise.

That's how Dr. Finley used her expertise in cell metabolism to help find a way to potentially target a type of aggressive childhood cancer known as pediatric rhabdomyosarcoma — a rare soft tissue cancer that develops in the muscles and for which there are currently no effective treatments.

"Kids shouldn't get cancer," she says. "Unlike with adults, there aren't genetic changes that have built up over a lifetime. Instead, something has just gone horribly wrong in their cells. We thought there was a good chance cell metabolism played a role."

Dr. Finley reached out to colleagues specializing in pediatrics at MSK Kids, and soon a collaboration blossomed.

"It's wonderful how the doctors here are excited to collaborate with scientists to innovate and find new ways to improve patient care," she says.

Ultimately, the research identified critical nutrients the cancer cells need to survive. The team also showed that one of the oldest, cheapest, and best-studied cancer drugs, methotrexate — which targets cell metabolism — could effectively slow the cancer's growth in mouse models.

In Metabolism, the Medium Is Also a Message

When cells metabolize nutrients, they create fuel and building blocks called metabolites.

Metabolites can also serve as important signals, Dr. Finley notes — signals that can be harnessed to fight cancer.

One study from her lab — a collaboration with the lab of cancer biologist Scott Lowe, PhD — found that simply giving pancreatic cancer cells a metabolite known as alpha-ketoglutarate could get them to revert to an earlier state and make them less malignant.

"To me, this is one of the most exciting areas of cell metabolism," Dr. Finley says. "Here the idea is that metabolites are telling the cell something really important, sending a signal. And what we found is that certain metabolites can really change behaviors that drive cancer."

Dr. Finley says this discovery is exactly why studying fundamental cell biology is so important, because it shows how a cell's metabolism can be harnessed against cancer.

"It also means that cancer cells aren't necessarily permanently trapped in this malignant identity," she says. "They're receiving signals that are pushing them toward malignancy, and if you can know what those signals are, if you can undo them, then that cell can come back to a much more normal state."

For Dr. Finley, Cancer Is Also Personal

For Dr. Finley, studying cancer isn't just a job, it's also personal. During her time as a postdoctoral fellow at MSK, she was treated here for thyroid cancer. Both of her parents have also been patients at MSK — her mother for amyloidosis, a condition that was treated with a bone marrow transplant, and her father for a rare bladder cancer. In each case, the treatment was a resounding success.

"I've seen this institution from the perspective of the patient and from the perspective of someone sitting next to the patient," she says. "I've seen it from the standpoint of somebody in the laboratory looking at patient samples that have been generously provided for research. And what I've seen in all of these different perspectives is an absolute commitment to patient care. This is a place that finds excellence at every single moment, and I am very proud to be a part of it." •

Dr. Finley's research is supported by the MSK donor community, including **The Pershing Square Foundation, Richard and Atlanta Warke**, and **The Edward Mallinckrodt, Jr. Foundation.**

Dr. Finley holds a **Geoffrey Beene Junior Faculty Chair.**

Relentless Research

How MSK Turns an Idea From the Lab Into a Lifesaving Drug

Joanne Ferrari-Mautino sensed something was wrong as soon as the X-ray ended.

"We'd like you to wait so a doctor can speak with you," the technician told her.

"I've been a nurse for 20 years," Joanne says. "I knew it was not a good sign."

Joanne, 50, had been prescribed an X-ray for a persistent cough and shortness of breath while exercising.

More tests at her local hospital revealed tumors throughout her body. Days later, she and her mother met with a general oncologist. "He told me I had stage 4 non-small cell lung cancer and 18 months to two years to live," she recalls. "My mom passed out in the doctor's office."

With a teenage son, a boyfriend, and a happy life in small-town Connecticut — including a flock of chickens she dotes on — Joanne's world turned upside down overnight.

But she says what happened next felt like divine intervention.

First, tests pinpointed the gene malfunction causing her cancer — called a ROS1 fusion. Then she was told about a world-renowned physician who studies this particular fusion — Alexander Drilon, MD, at Memorial Sloan Kettering Cancer Center (MSK). She got an appointment with Dr. Drilon, which changed everything for her.

Joanne would come to experience firsthand the power of MSK's drug development program, which not only creates new medicines, but also constantly improves them to stay ahead when cancer develops resistance.

To Joanne, this MSK research "feels like a miracle," she says. "I live a normal life. Sometimes people don't even know I have cancer."

Taking Aim at ROS1 Fusions, Like Luke Skywalker

Nearly a decade before Joanne was diagnosed, Dr. Drilon was at work trying to understand the ROS1 fusion. Although this fusion is rare, it ruthlessly powers the growth of cancer cells in a subset of patients, most often those with lung cancer.

As Chief of Early Drug Development at MSK and a thoracic medical oncologist, Dr. Drilon's research has focused on fusions that drive cancer. The ROS1 fusion is squarely in his crosshairs.

To form a ROS1 fusion, a piece of one gene breaks off and attaches itself to the ROS1 gene.

"We don't know exactly what causes this kind of gene change," Dr. Drilon says. "But what happens after one gene hooks up with a second gene is that the fusion goes hyperactive. This rewires a normal cell into a cancer cell that grows out of control."

But the gene fusion has a weak spot. "The protein created by the fusion gene has a little pocket," Dr. Drilon explains. "Drug designers have created medicines — called inhibitors — that bind to this pocket."

Dr. Drilon compares the result to a famous scene in *Star Wars*. "Think of the pocket like the small hole on the Death Star that Luke Skywalker fires a bomb into. Hit the pocket, and you shut down the fusion gene and the bad effects of the hyperactive protein."

Based on this understanding, in 2016, Dr. Drilon led a clinical trial for an early version of a ROS1 inhibitor called entrectinib (Rozlytrek).

"Most people saw their lung tumors shrink," Dr. Drilon says. "Symptoms like pain or difficulty breathing decreased, improving their quality of life."

The success of Dr. Drilon's trial led the U.S. Food and Drug Administration (FDA) to grant accelerated approval to entrectinib in 2019.

The Arms Race Against Cancer Resistance

Dr. Drilon and his team were not satisfied, however.

"Entrectinib was better than an older ROS1 inhibitor, but we thought it could be improved."

Cancer treatment is an arms race. "Cancer is smart," says Dr. Drilon. "The pocket in the ROS1 fusion adapts in some patients to become smaller and narrower. That prevents the drug from binding, and the cancer becomes resistant."

Dr. Drilon and his team thought the solution might be a new, second-generation inhibitor. This is where MSK's reputation and collaboration with

Joanne Ferrari-Mautino (center) with her son, Rocco Mautino (at left), and her boyfriend, Robert Fernandez

researchers in the larger scientific community is invaluable.

"I discussed the problem with the scientist at the pharmaceutical company who designed the drug, Dr. Jean Cui," Dr. Drilon says. "She said, 'I made something smaller to fit into the tighter pocket.' "

Sure enough, the new version of the drug better fit the pocket in lab studies, paving the way for Dr. Drilon to lead a clinical trial for patients with this second-generation ROS1 inhibitor, called repotrectinib (Augtyro).

Matching Patients With Precision Medicines

One of the most important elements in MSK's success in developing new medicines is a test called MSK-IMPACT®. It was developed by the MSK Molecular Diagnostics Service, which is part of the Marie-Josée and Henry R. Kravis Center for Molecular Oncology.

MSK-IMPACT analyzes tumors to detect changes in more than 500 genes of common and rare cancers. After sequencing a tumor and identifying possible fusions or mutations to target, a computer matches the patient with the clinical trials most likely to help them.

This matching system results in faster, more efficient research. Most importantly, says Dr. Drilon, "We can connect with patients as early as possible, when they are strongest and most likely to benefit from a new therapy."

That's how Dr. Drilon's clinical trials were able to find patients with ROS1 fusions. Many patients were able to join the repotrectinib trial at MSK, and it turned out to be much better than the earlier inhibitor entrectinib.

"Patients' cancer symptoms improved," says Dr. Drilon, "and the drug helped people for a longer time than entrectinib when given as their first treatment."

This second-generation inhibitor was granted accelerated approval by the FDA in 2023.

Anthony Valente (at left) and Dr. Drilon. "Every time I see him, we give each other a high five," Anthony says with a laugh.

Third Time Is the Charm — A More Powerful, Safer Drug

After this second-generation drug was approved, Dr. Drilon set out to find an even better inhibitor for patients. Drugs strong enough to overpower cancer can have unintended side effects. For some people, repotrectinib presented a challenging trade-off.

"It turned out that the drug inhibited not just the ROS1 protein, but also another protein that is important for daily functions of the nervous system," Dr. Drilon explains. Some people on repotrectinib experienced dizziness, pins and needles in their hands, and other nerve-related side effects.

"We were thrilled that this drug could help more patients, but we knew this side effect problem had to be solved," he says.

For the third time, Dr. Drilon and his team set out to improve ROS1 inhibitors.

"We met with a different pharmaceutical company, and they designed a drug called zidesamtinib in the lab," says Dr. Drilon. "It was the most precisely targeted inhibitor that science could create, and the results have been really good in patients."

This new and improved version works without the neurological side effects caused by the second-generation drug. It even works on tumors that have developed resistance to the first two generations of ROS1 inhibitors. And it can penetrate the blood-brain barrier to help patients with brain metastasis.

Again, after the successful clinical trial led by Dr. Drilon, the FDA gave the drug Breakthrough Designation, speeding its path to patients.

"The story here is really about persistence," says Dr. Drilon. "Chasing leads on one molecule after another for our patients."

Resistance Fighter

This constant pursuit of a better medicine has made a huge difference for Joanne — and also for Anthony Valente, 63.

Anthony came to MSK after a routine exam found tumors in his lungs. For Anthony, it was a full-circle moment. A few years before his diagnosis, his family's company had delivered concrete for the construction of MSK Koch in Manhattan.

"I was impressed by the building," Anthony recalls. "It turns out I went there for treatment. It's amazing, and so are the people working there."

Standard therapy worked at first under the care of thoracic medical oncologist Gregory Riely, MD, PhD.

But the tumors began to grow again. Dr. Riely strongly recommended that Anthony join Dr. Drilon's third-generation clinical trial.

"After I started zidesamtinib, the cancer shrunk and shrunk and shrunk," says Anthony. He credits the clinical trial team — and Andrea Valente, his wife of 40 years — with carrying him through. "She's been my constant companion during cancer," he says. "And thanks to Dr. Drilon's clinical trial, I actually feel better now than before I had cancer."

Dr. Alexander Drilon is a thoracic medical oncologist and Chief of Early Drug Development at MSK.

Searching for the Next Breakthrough

Dr. Drilon and his team are relentless.

Efforts are already underway to create a fourth-generation ROS1 inhibitor. MSK research fellow Matteo Repetto, MD, is using data analysis, AI, and related computational skills to design an even better drug.

"Our idea is to anticipate the next step the cancer takes to become resistant," Dr. Repetto says. He's studying new ways to make an inhibitor fit into the ROS1 pocket, even after resistance to third-generation inhibition. He's also exploring possible combinations with other medicines to make the drug stronger.

Dr. Repetto, a medical oncologist from Italy, came to MSK in 2022. "We have the best oncologists, the best pathologists, the best laboratories, and the latest technologies here. It's amazing," he says.

A World-Class Researcher and a Great Guy

For Joanne and Anthony, the compassion at MSK stands out as much as the science.

"As a nurse, I work with doctors every day," Joanne says. "I didn't expect a top research expert to be so kind. He and his team really care about me, not just my cancer. To me, these world-class researchers have become family."

"Every time I see Dr. Drilon, we give each other a high five," Anthony says, laughing. "He's such a great guy."

Anthony and Joanne say they look forward to continuing to live the lives they love, thanks to research that never stops pushing forward. •

Dr. Drilon's research is supported by the MSK donor community, including Nonna's Garden Foundation, The Gibbons Scattone Family Foundation, Stage4Hope, Keren Phillips and Deborah Kazis-Taylor for the Earle and Judy Kazis Foundation Fund, Sam K. Simon, Stephen J. Squeri, LesLois Shaw Foundation, and Break Through Cancer.

Meet MSK's New Chief Scientific Officer

Q&A With Dr. Ross Levine

Dr. Ross Levine is an internationally recognized physician-scientist dedicated to researching and treating blood and bone marrow cancers.

"There has never been a more exciting time for cancer science."

When Ross Levine, MD, walks into a meeting, his passion for science lights up the room. He's known for his ability to articulate an inspired vision for research, and he stops at nothing to achieve ambitious goals — including running the New York City Marathon every year with Fred's Team, the official running program of MSK.

As the new Chief Scientific Officer for Memorial Sloan Kettering Cancer Center (MSK), Dr. Levine is responsible for preclinical research, which provides the foundation for the discovery of better cancer treatments. Since joining MSK in 2007, Dr. Levine has distinguished himself as a physician-scientist studying the genetic basis of blood cancers and other blood disorders. As a young trainee, he was devastated when treatments failed to save patients with aggressive leukemia. He decided to dedicate his life to research, driven by the belief that hope starts in the lab — by creating new pathways for diagnosing and treating cancer.

Looking back on his 25 years as a scientist, Dr. Levine says, "I believe there has never been a more exciting time for cancer science."

What have we learned about cancer so far?

The way we understand cancer now is dramatically different from the way we did 20 years ago. We now have the technology to understand that every cancer is different. Even when it's classified by where it originates — the lung, the brain, the breast — there are molecularly defined subtypes. It's like looking at snow and then realizing that every snowflake is different.

Years of lab research now enables us to diagnose cancer with extreme precision, and that means in many cases we can tell patients, "We're going to tailor your treatment according to the unique molecular aspects of your cancer." The more we're able to do that, the more effective and better tolerated our treatments are becoming. And that's what gives us cause for optimism. We have lots to do, but cancer is a very different story than it was 25 years ago.

Will it ever be possible to stop cancer from developing in the first place?

This is an area where we're really in the early phases of what could be a transformative opportunity. It's finding cancer at the earliest stages and then intercepting it.

Cancer happens when abnormal cells are dividing uncontrollably. We probably all have them, especially as we age. But if we can identify the ones that are picking up steam and discover ways to stop them, that could change the whole game. I believe we need to really double down on that idea. There are groups at MSK and other institutions around the world using new technologies to analyze databases with hundreds of thousands of people to study what we call "precancer."

Our goal is to be able to better detect and intercept abnormal cells before there is an actual cancer and to give patients treatments before they would have ever gotten sick.

How can we speed up the process of taking a discovery in the lab and getting it to the clinic to help patients?

The pace of innovation in science has never been faster. Between new technology and new treatment approaches, we're seeing in real time the impact of advances in computing and artificial intelligence. Almost every day I pick up a journal and read that something amazing has happened based on advances in data science.

There are two things that stand out about MSK and make me so excited to take on this role. Number one, we have an amazing group of remarkably bright, fearless, creative people that are trying to do things others might say are impossible. The number of times that five years later their brainstorm idea actually works gives me tremendous hope.

The other part of what makes MSK so special is that we have teams that work extremely well together across the entire spectrum of research. We have preclinical scientists that have never met a patient but have uncovered incredible insights into the behavior of cells and why they become cancerous. We have people who are at the bedside who've never been in a research lab but then make the connection for how a recent scientific discovery might be able to make a difference.

I've seen personally how this all-encompassing approach saves lives. My sister is now an MSK patient living with multiple myeloma, which has become a highly treatable blood cancer thanks to years of research supported by Cycle for Survival and other generous giving.

People come to work and train at MSK knowing that at some point, their discoveries, whether it's today, tomorrow, or in 10 years, will actually help a patient. At MSK, it's team science. The sum is greater than the parts.

Despite all of the challenges that confront us these days, I am confident our journey is just beginning and our progress will continue to accelerate. •

Dr. Levine holds the **Edward P. Evans Endowed Chair for MDS.**

Funding the Future of Cancer Innovation

Every day, MSK doctors and scientists bring courage and creativity to cancer's biggest questions, turning innovation into impact. Support from MSK Giving, MSK's donor community, provides the resources they need to move their work forward, creating a better future for people with cancer worldwide. Last year, 348,000 donors gave to MSK, and each one made a difference through The MSK Campaign: Leading Science. Changing Lives. Philanthropic investments like the Fiona and Stanley Druckenmiller Cancer Innovation Fund fuel bold translational research and breakthroughs that are redefining cancer treatment. Thank you for changing lives with us.

To learn how the MSK Giving community is supporting better cancer care for the future, **scan the QR code**.

Cycle for Survival: Celebrating 20 Seasons

Cycle for Survival, the official rare cancer fundraising program of MSK, celebrated its 20th season with high-energy indoor cycling events nationwide and a new Official Performance Apparel Sponsor, NOBULL. Thanks to every rider, fundraiser, and donor, as well as founding partner Equinox, the movement has raised more than $450 million since 2007. The money raised during the 2026 season will be given to the labs of MSK scientists within six months, and every funded project will be announced on CycleforSurvival.org. This community is 20 years closer to beating rare cancers. Learn more and be part of what's next.

To learn how Cycle for Survival has advanced rare cancer research and lifesaving treatments at MSK, **scan the QR code**.

Memorial Sloan Kettering Cancer Center