#107 09 / 2025 ISSN: 2036-9468

CANCER WORLD

PATRICK SOON-SHIONG

HE WHO SPEAKS FOR THE PEOPLE

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CANCERWORLD
magazine is published
by OncoDaily (P53 Inc)

Email: info@cancerworld.net
Tel: +1 978 7174884

ISSN: 2036-9468

CancerWorld is not only about cells and treatments. It is about hope, endurance, and the voices that shape the fight against cancer—patients, doctors, scientists, advocates, families, caregivers, and the unsung heroes dedicating their lives to oncology.

In this issue, we bring them all to your radar. Our grand opening features Dr. Patrick Soon-Shiong, one of our dual cover stories. His career is more than a profession, it is a mission. His conviction that lifesaving cell therapies should not be reserved for the privileged few but made accessible to underprivileged communities is a powerful reminder that science without equity remains unfinished.

We are also honored to share the voice of HRH Princess Dina Mired of Jordan, a voice for the voiceless, a beacon for equity and equality, and a tireless advocate for accessible cancer care in Jordan, across MENA, and far beyond.

We also report on new research suggesting that certain antidepressants may do more than lift spirits, they can enhance T cell activity, shrink tumors, and improve survival across several cancer types.

Our gaze also turns outward, to the blue and green world. Plastic fragments are invading not only our oceans but also our bodies, and even our tumors. It is a stark warning: the environment we harm will inevitably harm us in return.

In these pages, caregivers speak. Too often invisible, they shoulder both devotion and exhaustion. Their voices remind us that cancer is never a solitary illness but a shared journey.

We confront the challenges of the digital era, where social media can offer connection and comfort to cancer patients, but also spread dangerous misinformation.

Latvia's puzzling cancer statistics, the promise of early detection, and the surprising link between radiotherapy and Alzheimer's protection—these are dots in a vast universe. Dots of science, compassion, and discovery.

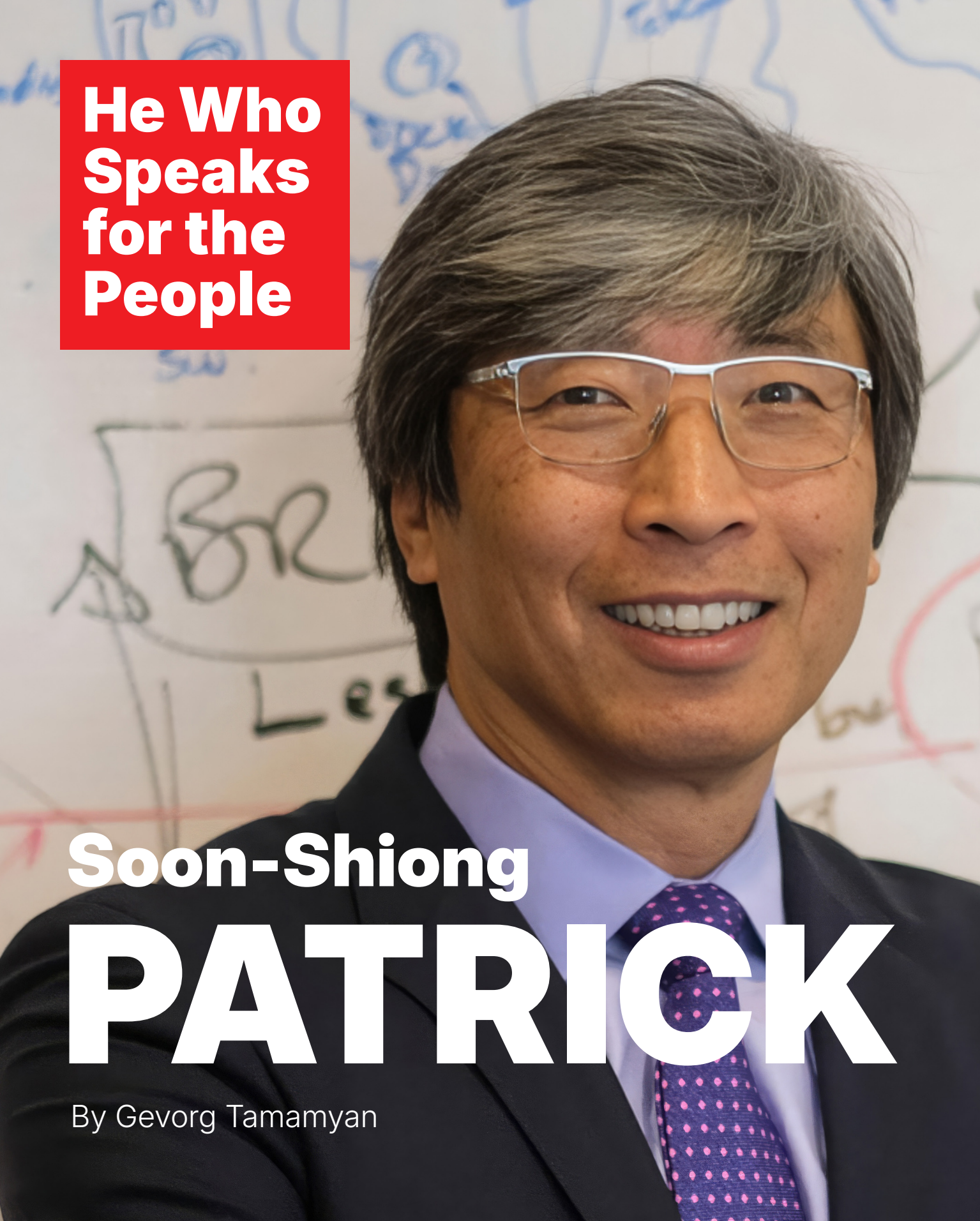
We also explore the new frontier of combination early detection and interception, where cutting-edge advances in genomics, immunology, and artificial intelligence are shifting cancer screening from late diagnosis to interception before the disease strikes.

Finally, we follow the remarkable journey of Dr. Nageatte Ibrahim, from a curious child to a trailblazer who helped bring pembrolizumab, a groundbreaking immunotherapy, to patients worldwide, forever changing the landscape of cancer care.

This issue is a tapestry of voices and visions, of equity, discovery, and resilience. And as we always say: progress in cancer care is not only about breakthroughs in the lab, but about the people who make them matter.

Adriana Albini, Co-Editor-In-Chief, CancerWorld

He Who Speaks for the People



Soon-Shiong PATRICK

By Gevorg Tamamyan

If you describe yourself in one sentence, what would it look like?
I wish I could have been Kobe Bryant.

Who is your role model?
I wish I could have been Kobe Bryant.

And what is your dream?
I wish I could have been Kobe Bryant.

***

When I entered the room to meet Dr. Patrick Soon-Shiong, it was clear from the start that this was not going to be a conventional conversation. His energy matched his ideas—restless, expansive, always pushing at the limits of what's possible. For decades, he has lived at the intersection of science, entrepreneurship, and humanity, a man who has challenged entrenched dogmas from the moment he first entered medical school during the apartheid era in South Africa.

Born into systemic injustice, he was one of only two Chinese students admitted to medical school. Instead of taking the safer path and leaving for the United States early, he chose to stay, working in a tuberculosis clinic, helping patients who had no one else to turn to—an act of compassion that even landed him in police custody. Later, when he did move to the United States, he became one of the most successful physicians–scientists of his generation. He doesn't like to be called "the richest doctor," and describes himself, with characteristic humility, as "a billionaire by accident." Yet what defines him most is not wealth, but the refusal to accept limits—whether in medicine, technology, or society itself.

Not a Rebel But Curious

When asked if it is difficult to be a rebel all his life, Dr. Soon-Shiong pushes back gently.

"I don't think I'm a rebel," he says, leaning forward with measured conviction. "What drives me is curiosity and the joy of discovery. But more importantly, discovery that has an impact on humanity."

For him, this spans far beyond medicine. "Whether it's health, climate change—which could also be existential—communications, or now artificial intelligence, which I've been talking about since 2008... discovery is what drives me."
What fascinates him is not simply invention for its own sake but illumination—the moment when understanding shifts. "The joy of discovering how your body works, how your brain works, what keeps us alive—and knowing, even if just for an instant, that you are the only person in the world who understands this idea or this result—that is what drives me."

A Hero in Principles: Senator John McCain

Dr. Soon-Shiong speaks with warmth about Senator John McCain, a figure he often calls one of his heroes.

"He stood up for principle," he reflects. "He stood up for what he believed was morally correct. I didn't see him as a Democrat or Republican or independent."

His admiration extends to the McCain family as a whole. "His wife—now the U.S. ambassador—has been deeply engaged in global issues like food insecurity. His son served the country. He himself dedicated his life to it. I got to know him personally when he visited our campus to understand what we could do for childhood cancer in Phoenix. And the McCain Institute he created became a gathering place for very smart people. So much of what he did resonated deeply with me."

Nant: More Than a Name

"Nantan, 'he who speaks for the people.' Is it you?" I asked.

He replied:
"Nantan—or Nant—the word could have whatever meaning you want. It started with Nantan, he who speaks for the people. But if you look at it, it's also the neural artificial net. It could be the neural ant, because ants follow each other through signals. It could be nanotechnology. But really, the idea is that you build something on a platform that covers health, climate change, communications, empathy, mental health, and—more importantly now—digital transformation. That is what I see as the mission of NantWorks."

Connecting the Dots

If there is one phrase he has returned to often, it is

"connecting the dots." I asked what dot comes next. "We were so far ahead of the time," he says, recalling his early experiments with NantMobile. "We created machine learning, machine vision—where the phone's camera could recognize the world and the blind could see. Back in 2010 or 2012, people told us: 'Who would use the camera on the phone? That's crazy.' Yet that was just the beginning."

For Dr. Soon-Shiong, the same principle applies to medicine. "Your body works in a very beautiful, exquisite way. Colliding proteins, colliding cells—it's like the universe. If you understand that, you can treat diseases—cancer, infection, sepsis, HIV—in a very different way."

In his journals, he sketches ideas as thought experiments. "When I finish a page, it's full of dots. To me, life is a circle—you can start anywhere, it doesn't matter. The problem is that cancer has outsmarted us for 75 years. We made the wrong assumptions. We tried to treat the cancer itself. But the dots I saw connected differently: treat the immune system, and the immune system will treat the cancer."

What's Next? Photoelectronics

As for the next dot, his eyes brighten.

"What's really exciting now is photoelectronics," he says. "I built the first semiconductor WIGIG chip with my team that can move over 2 gigabits per second. That's transistors and electronics. But imagine photons talking to electrons, to charges—that could transform how we transmit data."

This, he argues, is not just an engineering curiosity but a necessity in the age of artificial intelligence. "The world of AI will require transmission at terabytes per second. That's what I'm working on now."

"We're Winning Battles, But Losing the War"

"It's not as simple as that," Dr. Soon-Shiong began carefully. "I don't reject chemotherapy or radiotherapy outright—they do have a role. But I think our approach is wrong. The way we've used these treatments is as though they're nuclear bombs, meant to annihilate everything and hope something survives. That's why we've been losing the war. You may win the battle, but you lose the war."

He pointed out a striking blind spot. "As oncologists, you know hemoglobin levels and you treat anemia with epogen. You track absolute neutrophil counts and support them with neupogen. But when you do a complete blood count, do you look at the ALC—the absolute lymphocyte count?"

I mean, before listening to your podcast, I wouldn't., - I admitted.

"That's 99% of the nation," he replied. "And yet ALC reflects the natural killer cells and T-cells—the very cells responsible for clearing cancer or infection. Until today, there has never been a treatment in the history of mankind designed to stimulate them. That's been my challenge: how to shift the focus back to biology's first principles."

He called the prevailing paradigm a "circle of death." Chemotherapy suppresses red blood cells, neutrophils, and—fatally—NK and T-cells. Physicians then rush to restore anemia with epogen and neutrophils with neupogen, all to enable more chemotherapy. "But in that process, you're wiping out the very immune system that could cure the cancer," he said. "Madness, repeated for fifty years, justified as the standard of care."

Outsmart the Tumor

Dr. Soon-Shiong reframed the tumor not as a static enemy, but as a master of disguise. "The first thing a tumor does is hide. It downregulates the surface molecules that NK and T-cells would recognize. It stimulates suppressor cells to silence the immune system. That's how it grows."

His strategy: outsmart the tumor by turning its own tricks against it. "At low doses, chemotherapy or radiation doesn't destroy the immune system. Instead, it stresses the tumor, forcing it to expose itself. At that exact moment, if you activate NK and T-cells with IL-15—a protein your body already makes—you turn hiding into exposing, exposing into killing."
But the tumor adapts again. It secretes TGF-beta

to strengthen suppressor cells, and expresses PD-L1 to block checkpoints. "So then you suppress the suppressors," he continued. "Some chemotherapies can do that. And if you engineer NK cells to target PD-L1, you're killing both the tumor and its defenses at once. That's the orchestration I call the BioShield platform."

He likens it to conducting an orchestra: hide, expose, kill, suppress the suppressors, block the blockers—always a step ahead. To complete the cycle, he advocates pre-educating T-cells with adenoviruses, proliferating them and driving memory. "If you drive memory, you're close to a cure. That's connecting the dots."

Beyond the Numbers: The Human Cost of Disparity

The discussion shifted to a problem that troubles us both deeply: global disparities. In pediatric oncology, survival is not dictated by age, genetics, or presentation, but by the ability of a child to access treatment.

"Yes," he agreed gravely. "We say 80% of children in the U.S. are cured, and only 20% in the rest of the world. But even the 80% figure bothers me. Because the way we achieve it—through massive, toxic cocktails. Drug-related lethal toxicity. Secondary cancers down the line."

In his view, the distinction between liquid and solid tumors matters. "Leukemias are tumors of the immune system, so sometimes wiping out the immune system makes sense. But in solid tumors, wiping out the immune system is catastrophic. That's where immunotherapy must take us."

He cited promising work already underway. "We just published in Waldenström's macroglobulinemia—an incredibly rare lymphoma—showing that NK cells alone can toggle tumors. That's in motion now. Imagine applying that approach globally."

Democratizing Cell Therapy

But science alone cannot bridge the gap. Cost is another towering barrier. "Cell therapy—CAR T, NK cells—costs a million dollars in the United States," he said. "That's unsustainable. No country, no system, no patient population can bear it. Africa? Impossible."

His answer lies in automation. "We're working on using AI and robotics to build these cells at scale. If we succeed, we can democratize this therapy. Imagine a world where a child in Ghana or Bangladesh has access to the same NK cells as a child in Boston or Los Angeles. That's what keeps me going."

You Build Your Life on the Shoulders of Others

When asked about mentors—the figures who shaped his path—Patrick Soon-Shiong's answer wove together the influences of scientists, surgeons, visionaries, and even athletes.

"In South Africa," he recalled, "I trained under a professor who gave weekly lectures on surgical technique—and on ethics. His son was fiercely anti-apartheid, and through him I became one of the first Chinese doctors allowed to work in a white hospital."

His journey took him across continents, collecting teachers along the way. At UCLA, he trained under Dr. Haile Debas, "a fantastic scientist who brought me with him." Dr. Donald Morton, a pioneer in immunotherapy who injected melanoma directly into patients. Dr. David Sutherland, who taught him pancreas transplantation—until Patrick himself decided the risks were too high for patients. He even collaborated with NASA's Jet Propulsion Lab, where Alan Rembaum helped him design magnetic microbeads to isolate islets.

"You build your life on the shoulders of others," he said with humility. "It's an evolution of thought."

Mentorship, for him, also ran in reverse. "Watching Kobe Bryant was one of the great privileges of my life. His intelligence, his work ethic, his focus—it was remarkable. Being able to mentor him in some ways, and be mentored in others, was one of the most satisfying experiences."

Mentorship in Both Directions

When asked about his own mentees, Dr. Soon-Shiong was hesitant to claim the title. "I don't know if they consider me a mentor," he admitted. "But I've worked with Kobe. With Metta World Peace. With Pau Gasol. I wanted to help professional athletes who often get taken advantage of once their careers end. And of course, I work with young people in science. That matters to me."

Books

"Which books would you recommend reading?" I asked.

"There are many," he said. "I just gave Jon Stewart a book on the nude mouse and Taxol. But the one I'm reading now is Irreducible by Federico Faggin. It's about human energy, artificial intelligence, and consciousness. It's powerful."

Reinventing the Los Angeles Times

Today, Patrick Soon-Shiong also presides over one of the world's most storied news outlets—the Los Angeles Times. In his eyes, journalism is just another bridge to understanding, much like science itself.

"This brand is amazing," he said with pride. "We are still the largest newspaper west of the Mississippi. When I bought it, the first thing I did was modernize it with a new content management system—Graphene—capable of podcasts, live streams, education, lifestyle, and more."

His vision is expansive. "I grew up in South Africa inspired by newspapers. Now, I believe the LA Times can become a platform far beyond print. Sports, e-sports, education, medical journals, lifestyle, entertainment, events. It can convene people—whether in an e-sports stadium or in a forum for breakthroughs in medicine and science." He pointed to a series he and his colleague Jen Hodson once hosted in Jackson Hole, Wyoming. "We brought together the brightest scientists, political leaders, and rural physicians who otherwise would never meet. For three days, breakthroughs were shared openly. That's what I want to scale: shrinking the gap between scientific discovery and clinical practice."

He pointed out the gap between basic science and clinical journals. "Cell and Nature live at the fundamental level. New England Journal and Lancet at the clinical. But where is the journal that translates mechanism into medicine? Abraxane, for example—it isn't just Taxol. It's transcytosis via the GP60 receptor into the tumor microenvironment. Most don't know that. We need a place for that knowledge."

That journal, he revealed, is already forming in his mind: The Journal of Breakthroughs in Medicine.

Professor

"You know that I am a visiting professor at Imperial College London," he asked me with a smile.

Well, that would not be a surprise to me. Any university in the world would be honored to have him among its faculty. But why was he asking in such an intriguing way?

"But it is on microelectronics," he continued. "With Chris Toumazou, and with Sir Sykes—the head of the NHS—we are working to build a device that can perform a full PCR in 15 minutes at the point of care. Imagine tying that to circulating DNA, to proteomics, to drug guidance in real time, even to infections like UTIs. We hope to launch it within a year. But to explain it, you need microelectronics engineers, PCR experts, and clinicians all speaking together. That's the journal I envision: connecting dots that matter to humanity."

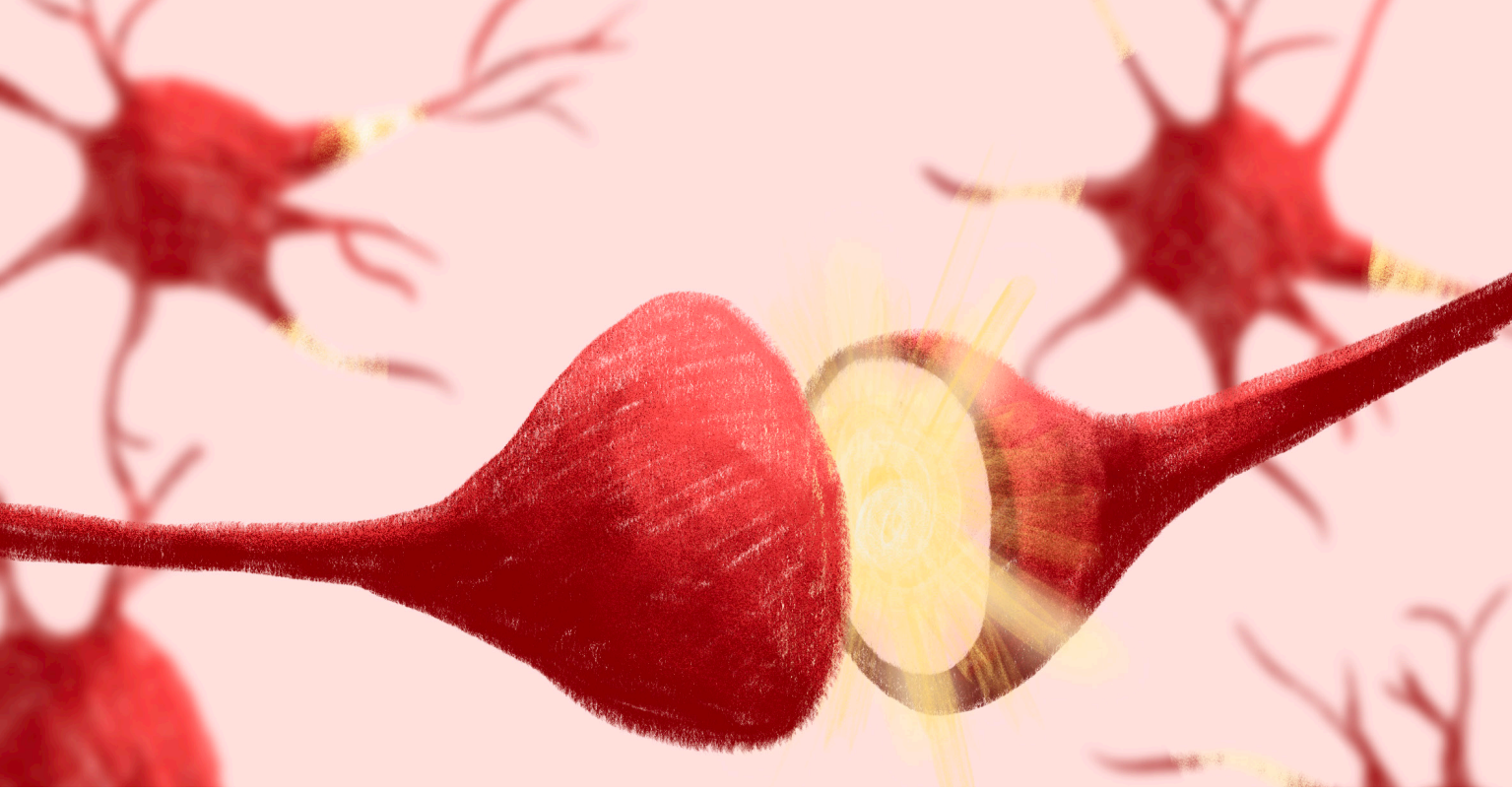
Advice to the Next Generation

"The internet is actually an AI that is going to prevent critical thinking. My advice? Sometimes, put it down. Pick up a pencil. Write. Find a place of peace. I worry about the sense of purposelessness I see in young people, the depression, the chaos. My advice is simple: find a place where you have peace and be happy and be content."

I’m a Doctor

As for his own success, he offered no formula. “Be true to what you enjoy. Passion. Curiosity.”

And at the very end, he reminded me of the identity that has never left him. “At the end of the day, I’m a doctor. My calling is to treat patients at scale. To think across scales—from the nano to the whole human. To cross silos, question dogma, and refuse to be confined to one path. That’s not success, necessarily. It’s just the way I live.”



Antidepressants Show Potential to Fight Cancer

By Janet Fricker

Selective serotonin reuptake inhibitors (SSRIs) enhanced the ability of T cells to fight cancer and suppressed tumour growth across a range of cancer types in both mouse and human tumour models.

The study, published in Cell, May 20, further showed that cancer patients with low levels of the serotonin transporter (inhibited by SSRIs) showed improved survival in comparison to patients with higher levels. "It turns out SSRIs don't just make our brains happier, they also make our T cells happier – even when fighting tumours," says Lili Yang, the senior author, from UCLA Health Jonsson Comprehensive Cancer Center, Los Angeles, California. "These drugs have been widely and safely used to treat depression for decades, so repurposing them for cancer would be a lot easier than developing an entirely new therapy."

Immune checkpoint blockade (ICB) therapies, which combat the immunosuppressive nature of tumours by antagonising negative immune regulators, are only effective in around 15 to 25% of patients. Much of the focus of ongoing cancer immunotherapy research is the development of strategies to better support potent immune responses.

Although serotonin (also known as 5-hydroxytryptamine) is widely recognised as a neurotransmitter that works in the central nervous system regulating sleep, mood and behaviour, **only ~ 5% of the body's serotonin is synthesised in the brain.** The vast majority (around 95%) is produced in the gut [MOU1] [JF2] , and beyond its role in

regulating gut motility and inflammation, serotonin is transported via platelets to peripheral tissues. Here it serves as a signalling molecule regulating physiological processes, including glucose metabolism, adipogenesis, insulin secretion, and tissue regeneration.

The connection between serotonin and immune function first emerged from observations that immune cells isolated from tumours had higher levels of serotonin-regulating molecules. In 2021, Yang and colleagues reported in Nature Communications that T cells produce MAO-A (an enzyme that breaks down serotonin and other neurotransmitters, including norepinephrine and dopamine) when they recognise tumours, making it harder to fight cancer. The team went on to demonstrate that treating mouse models of melanoma and colon cancer with MAO inhibitors helped T cells attack tumours more effectively.

SSRIs, used to increase serotonin levels in the brain, work by inhibiting the serotonin transporter (SERT), thereby alleviating symptoms of depression and anxiety. Due to safety concerns around MAO inhibitors (including serotonin syndrome and hypertensive crisis), the team switched their attention to SERT, a different serotonin-regulating molecule. "By contrast, SSRIs selectively target the SERT, avoiding interference with other monoaminergic pathways. This specificity contributes to their favourable safety profile, making them one of the most widely prescribed antidepressants," write the authors.

For the current study, Yang and colleagues tested the two most prescribed SSRIs, fluoxetine and citalopram, in mouse models of melanoma, breast, prostate, colon and bladder cancers. The SSRI doses used reflected therapeutic doses in humans, producing comparable serum SSRI levels.

Results showed that in all tumour models, administration of SSRIs reduced average tumour size by over 50% an d made killer T cells more effective at killing cancer cells. Safety of the SSRI treatments was validated by the lack of exaggerated tissue inflammation, autoantibody induction, and systemic peripheral T cell proliferation and hyperactivation outside of the tumours.

The team also showed that administration of SSRIs resulted in reduced tumour growth in xenograft human tumour models of melanoma and human neuro-endocrine prostate cancer.

In mouse models of melanoma, the team went on to investigate whether combining SSRIs with anti-PD-1 antibody (a common immune checkpoint inhibitor) improved outcomes. Results showed that the combination significantly reduced tumour size in all treated mice, and that in some cases mice even achieved complete remission.

The investigators found that SSRIs, unlike MAOIs, which induce aggressive behaviour in mice, did not provoke abnormal behaviours.

To investigate the clinical relevance of SERT levels, the team used tumour immune dysfunction and exclusion (TIDE) computational methods to explore correlations with outcomes in 67 patients with melanoma, 233 with breast cancer, 484 with lung cancer, 259 with kidney cancer and 258 with sarcoma. Results showed a statistically significant increase in survival for patients with low versus high SERT levels for melanoma ($P = 5.07 \times 10\text{-}5$), breast cancer ($P=0.0272$), lung cancer ($P=0.0377$), kidney cancer ($P=0.0147$) and sarcoma ($P=0.0313$).

"These findings highlight SSRIs as safer, more effective candidates for targeting the intratumoral serotonin axis in next-generation cancer immunotherapy," conclude the authors.

A limitation of the study, they add, is that it did not explore whether SSRIs also affect intratumoral neurogenesis and whether neuroimmune cross talk can influence disease expression. "Further investigation into these cross-system complexities of serotonin signalling and the impact of SERT inhibition on these dynamics will increase the applicability of SSRIs and deepen our understanding of the TME [tumour micro environment]," write the authors.

Next, the team plans to explore whether cancer patients treated with checkpoint inhibitors do better when also prescribed SSRIs. "Since around 20% of cancer patients take antidepressants — most commonly SSRIs — we see a unique opportunity to explore how these drugs might improve cancer outcomes," says Yang "Our goal is to design a clinical trial to compare treatment outcomes between cancer patients who take these medications and those who do not."

She's Gone and Done It

The Story of Dr. Nageatte Ibrahim

By Yeva Margaryan

Dr. Nageatte Ibrahim has spent her career at the intersection of oncology, science, medicine, and with achievements resulting in global impacts. Trained as a physician and scientist, she played a central role in the development of **Keytruda**, one of the most important cancer therapies of the last decade. Her work helped bring this immunotherapy to patients around the world, changing the treatment landscape for melanoma and other difficult-to-treat cancers.

Raised internationally, Dr. Ibrahim brings a multicultural perspective to everything she does. This article traces her path, from her early passion for medicine to her leadership in oncology research, and explores what drives her to keep going.

A Multicultural Spark

Born right outside of Paris and raised across continents—Europe, Africa, Asia and North America, Dr. Ibrahim carries a passport stamped with cultural depth. Her formative years were defined by transition, discovery, and a richness of diversity. "I grew up around the world," she explains, detailing a life that included learning and speaking French and Arabic, experiencing both Eastern and Western cultures and modern vs traditional ways of living. The mosaic of cultures gifted her with a sense of belonging everywhere, and nowhere. It taught her adaptability, empathy, and a love of connecting with people across cultures.

"As a child, my parents would describe me as very inquisitive," she says, laughing. Curious and inventive, she skipped dolls for pots and pans and anything 'real' she could get her little hands on, an early sign of the determined problem-solver she would become.

From Curious Child to Cancer Warrior

By first grade, her purpose was clear. "I knew I was going to be a doctor," she says. That intuitive certainty guided her through college, where she majored in molecular biology and biochemistry at Rutgers and discovered her first professional home in cancer research.

Her time in Dr. Eric Rubin's lab proved pivotal. "We were doing cancer research... analyzing tumor specimens for protein shifts after chemotherapy," she recalls. It was in that lab, surrounded by microscopes and the scent of possibility, that oncology claimed her heart.

Dr. Ibrahim presenting pivotal Phase 3 trial results at a 2015 conference in Japan, the first study she led at Merck after taking charge in 2014.

She was drawn to the complexity, the challenge, and the unrelenting demand for precision. "I get bored easily," she admits. So, oncology, with its puzzles and evolving breakthroughs, offered the perfect intellectual playground.

The Power of Perspective

College also shaped her worldview beyond academics. She reflects deeply on the pressure of finding one's purpose: "There's always a lot of pressure, choose your major, and you have only 4 years to figure it out." But for Dr. Ibrahim, mentorship and small-group science courses provided the clarity she needed. She credits those experiences with helping her imagine a future that balanced patient care with groundbreaking research.

A stint as a microbiologist at Merck added another layer to her understanding. "That planted a seed," she explains, noting how the work on an anti-parasitic product for animals gave her an early glimpse of the role pharma could play in improving

lives, not just from a lab bench, but on a global scale.

A Dream Come True: Tufts, Harvard, and Dana-Farber

Dr. Ibrahim's academic path carried her through some of the most prestigious medical institutions in the country: Tufts, Harvard, and Dana-Farber. "It was a dream for me to get to Boston," she recalls. At Tufts, she immersed herself in research, especially in melanoma, under the mentorship of Dr. Frank Haluska.

At Massachusetts General Hospital, she expanded her expertise to include breast cancer. "Melanoma was great in the lab, but very sad in the clinic. There was nothing at this time to give patients and chemotherapy really didn't work. So, you were just dealing with, unfortunately, side effects and symptoms of disease progression." she says. "Breast cancer offered a world of possibilities, a lot of hope." She speaks with reverence about the colleagues she worked with, many of whom are world-renowned. A T32 NIH training grant gave her extra time to deepen her scientific roots, time she says paid dividends later when interpreting complex clinical data.

A Leap of Faith into Pharma

Her move from academia to pharma was driven by timing, instinct, and an insatiable desire to do more. When she joined Dana-Farber in 2009, the melanoma landscape was grim. But within a year, "it exploded with novel medicines," she says, citing the rise of CTLA-4, PD-1s, and BRAF/MEK inhibitors.

"Showing that immunotherapy could work, especially in melanoma, was huge. That's a treatment that's been tried for decades and decades and no success. Failed study after failed study after failed study, no matter what people tried. And then came targeting the BRAF genetic mutation in patients who carry it in their tumors, the treatment literally made a life and death difference for patients."

Dr. Ibrahim recalls one of the first patients she treated with a PD-1 inhibitor who "presented with a very large mass, about 6 inches in diameter on her left thigh" she notes. As the patient continued on treatment, "the tumor kept on shrinking right before our eyes. Finally, when it was small enough it was resected surgically, rendering this patient with advanced melanoma disease free" she says with amazement. Dr. Ibrahim knew at that time this would be just the beginning of a new era in oncology.

Despite her thriving clinical practice, she longed for more involvement in clinical research and drug development. "What was lacking for me was the challenge of doing clinical research, and having the time and resources to do that," she explains. Conversations with friends in pharma sparked a realization: the change she craved might lie outside academia.

Her first industry role was at GSK, helping secure full FDA approval for a melanoma drug combo, dabrafenib plus trametinib in metastatic BRAF mutated melanoma. "That was very rewarding because I saw first-hand how these drugs work in patients and the time it buys them." Later, she joined Merck, a name now synonymous with cancer immunotherapy breakthroughs. Still, she confesses, "Was it scary? Yes. Because I didn't know what I was getting into." But she had a backup plan: if pharma wasn't the right fit, she'd return to academia.

She didn't have to.

A Defining Era at Merck

Dr. Ibrahim describes her years at Merck as nothing short of extraordinary. "I call it a once-in-a-lifetime opportunity," she says. When she joined, Merck Oncology was still young and struggling but she was excited to work once again with her mentor, Dr. Eric Rubin. Keytruda had just entered the scene, and it would change everything.

"I was so busy... up at two in the morning with my team on Teams, texting, problem-solving. It was that passion, knowing the drug worked and seeing it save lives."

Having administered immunotherapies like Keytruda in the clinic at Dana-Farber, Dr. Ibrahim brought firsthand experience to pharma. She understood the transformative potential of immunotherapy in melanoma, which she saw as one of the most formidable cancers. "If we can crack melanoma, others will follow," she predicted, and she was right. Thrown into the deep end, she was handed a Phase

III front-line melanoma study that had just completed enrollment. Within six months, the trial's endpoints hit, and she was charging through the FDA filing. "It was beautiful data," she says for how Keytruda helped these patients.

She rose quickly to become the melanoma program leader, overseeing a complex international adjuvant Phase III study co-run with EORTC for resected stage III melanoma. "It was a beast of a study," she says, involving multiple global regions, CRO partners, and regulatory hurdles. But she thrived in the chaos. Her team's passion mirrored her own: "If we can't move the mountain, we'll dig a tunnel through it." The positive results of this pivotal trial led Dr. Ibrahim and colleagues to study Keytruda in resected high-risk stage II melanoma launching the first global phase III study for this disease and the results have changed how patients around the world are treated.

Building on her success and known for her inspirational and inclusive team leadership style, she climbed the ladder again to the VP ranks where she also lead the GI cancer teams noting accomplishments in the treatment of front-line biliary cancer with Keytruda and chemotherapy, launching another unique study in hepatocellular cancer evaluating the addition of Keytruda plus Lenvima to liver directed therapy (TACE) as well as leading the esophageal and gastric teams through global filings to deliver active Keytruda plus chemotherapy combinations. Among her most impactful experiences was leading a unique team called Innovative Strategies which focused on tumor agnostic and biomarker driven approaches to treating cancers. The US FDA approval of Keytruda for TMB-H (tumor mutation burden-high) tumors, regardless of the tumor type (agnostic), was a major accomplishment for this team, building on the prior tumor agnostic approval for MSI-H (microsatellite instability-high) cancers, both considered major breakthroughs in oncology. Dr. Ibrahim's responsibilities didn't end here though; her contributions ran through all of Merck oncology and she and her teams were viewed as trailblazers and examples for others to emulate and push the boundaries of what is possible. With the leadership of seasoned drug developers, Dr. Roy Baynes, Dr. Roger Dansey and Dr. Roger Perlmutter, there was no stopping this high-speed train of innovation and execution.

Her connection to Keytruda ran deep. She had treated patients with it, seen tumors melt away, and knew from experience that this was a life-saving drug. The work was grueling, often emotionally intense, but it was also the most meaningful chapter of her career. She poured herself into not just the trials but the infrastructure, building and leading teams, mentoring new hires, and shaping Merck Oncology's identity. "We were building something from scratch," she reflects. "And it worked."

The Courage to Build Again: A New Chapter at Innovent and Beyond

Leaving Merck was the beginning of another bold leap. Dr. Ibrahim joined Innovent Biologics USA, a biotech subsidiary of Innovent China, stepping into the role of Chief Medical Officer of Oncology.

Dr. Ibrahim with her mentor, Prof. Eric Rubin.

Dr. Ibrahim with her husband, Alaa Salman

The move from big pharma to biotech was dramatic, but invigorating.

"It was a big change," she admits. "In large pharma, you have a lot of resources and you know who to call. In biotech, you're building from the ground up with sometimes not more than a handful of people. You get to wear a lot of hats and step out of your comfort zones; but that can also be a lot of fun."

At Innovent, her days began early, often with meetings involving clinical trial teams in China. With Innovent headquartered in Suzhou and her team in the U.S. still lean, she straddled time zones, strategy meetings, and science reviews. "We were running Phase I through III studies. Everything from safety checks to identifying early efficacy signals to navigating global regulatory pathways," she says. Despite the chaos of time zone juggling and a small team, Dr. Ibrahim thrived. "Every day was different, and I loved it."

"There are patients around the world who never see these innovations," she says. "We need to fix that."

Her goal is ambitious: bringing cutting-edge innovation to underserved regions globally. "I want to help bridge that gap," she says. It's not just about science anymore. It's about access, equity, and global inclusion.

Through her career paths her mission remains unchanged: to push the boundaries of what's possible in cancer treatment, and to do it with compassion, curiosity, and conviction.

Dr. Ibrahim continues on her mission of clinical research excellence to achieve more breakthroughs in treating patients with cancer. As the next step in her mission, she started a consulting company, Arc Nouvel, working alongside colleagues with whom she has spearheaded major immunotherapy breakthroughs. This team will bring expertise in innovation, planning and execution across clinical development to foster the next wave of oncology medicines.

They Said 'You Went to the Dark Side'

She's candid about the early stigma she felt from peers: "People used to say, 'You went to the dark side, the dark league of medicine, you chose money instead of patients'" But she counters that with pride. "I was working just as hard, if not harder, to bring effective drugs to patients and always keeping the patients' needs at the forefront of what I did."

The narrative has since shifted. "There's more respect for people in pharma now," she notes, especially given the success of PD-1 inhibitors and other novel agents. "Progress would not be possible without doctors in pharma. I think now there is more of a realization for physicians of what a career in pharma could look like and its impact on the greater good."

Who is Dr. Ibrahim?

Dr. Nageatte Ibrahim is a force in oncology, brilliant, bold, and brimming with energy. But beyond the lab coat and leadership, who is she? In this rapid-fire Q&A, we peel back the layers to reveal the dreamer, the traveler, the gardener, and the woman on a mission to help cure cancer.

A legacy she hopes to leave in the oncology world

I want to be remembered as part of the group that cured cancer. I've seen tumors melt away. I just want more patients to experience that.

An advice she would give to her younger self

Slow down. Spend more time with family and friends. Time is precious and you don't get it back.

Passions outside medicine:

Gardening, traveling the world, and spending time with family and friends.

One word colleagues would use to describe her

Empathetic.

Quote she lives by

You will regret more the things you didn't do than the things you did.

Favorite movie

It's a Wonderful Life. "It's my Dad's favorite movie and we watch it together every year; it holds a special place in my heart and I love how it show's each of us has a purpose in life."

If a biography were written about her, the title would be

She's Gone and Done It.

Alternate career path

I'd be a singer and dancer and make people laugh. Or an FBI agent," she laughs. "I like solving mysteries."

Colleague to interview next

Dr. Gursel Aktan, breast cancer expert and Women's Cancer program leader at Merck. "She's always been a great inspiration and support for me."

In the end, Dr. Nageatte Ibrahim is indeed a mystery solver, of cellular puzzles, of systemic gaps, and of how to lead with both brilliance and heart.

By Adriana Albini

Detecting Cancer Before It Strikes

The Promise of Combination Early Detection and Interception

For decades, early cancer detection has predominantly relied on organ-specific screening programs—such as mammography, Pap test, or colonoscopy—to detect malignancies as early as possible. While these approaches have indisputably saved lives, they inherently capture only a limited range of cancers, detect alterations already beyond the very initial stages, and tend to overlook the subtle biological changes that silently prime tissues for malignancy. Cancer screening has focused on detecting clinically visible or histologically confirmed lesions in specific organs. For many tumors, reliable screenings are not available, potentially missing many high-risk individuals whose early molecular alterations remain silent, so they stay undetected until symptoms appear, which can substantially limit the benefit of subsequent treatments. Traditional methods are largely "blind to biology," missing the dynamic drivers of cancer—such as somatic genetic mutations, immune microenvironment changes, metabolic shifts, and microbial imbalances—that can create a permissive state for tumor initiation, sometimes years before lesions form or become radiologically apparent. The emerging model of early cancer detection and interception is rooted in molecular and microenvironmental understanding.

Recent years have seen dramatic advances in molecular biology, genomics, immunology, and artificial intelligence, together creating the possibility of genuinely proactive, personalized cancer interception. This new paradigm aims not only to detect cancer earlier, but to intercept its very emergence by identifying and targeting the biological drivers and enablers of carcinogenesis—including genetic and epigenetic alterations, chronic inflammation, immune dysfunction, and shifts within the human microbiome—well before overt disease manifests. In a recent review, with Giovanni Corso, Dario Trapani, Francesco Bertolini, and Roberto Orecchia at the European Institute for Oncology, IRCCS IEO, Milan, we explored the scientific foundations and future prospects of this shift in a paper for Cancer Prevention Research of the American Association for Cancer Research (AACR).

Our model of "combination early detection" proposes to identify several of the earliest molecular or cellular alterations—such as mutations in cancer genes, accompanied by investigations on the establishment of local or systemic inflammation, epigenetic dysregulation, and evolving immune escape mechanisms—that drive the stepwise progression from normal tissue to malignancy.

Prof Giovanni Corso (IRCCS IEO and Milan University) and Prof Adriana Albini, first and senior author of the Opinion Paper on Early Detectio.

These changes can be further compounded by shifts in microbial communities, such as dysbiosis in the gut or airways, known to modulate both systemic inflammation and epithelial homeostasis, and to influence therapy response. The idea was first developed with the Bioscience Institute, proposing approaches that can be further developed.

Lessons from cardiology reinforce this paradigm shift. Cardiovascular risk stratification integrates multiple quantitative parameters—lipids, glycemia, blood pressure, inflammatory markers, family history—within predictive models to guide timely preventive interventions, such as statin treatment or antihypertensive medications, even before symptoms develop. Oncology has traditionally lacked an equivalently nuanced risk and prevention philosophy. However, recent multiomic technologies now allow the combination of genetic, transcriptomic, proteomic, and metabolomic data

into individualized cancer risk profiles. These can incorporate polygenic risk scores (PRS), immune signatures, metabolic fingerprints, and even microbiome-derived markers, and have been shown in pan-cancer analyses (such as those from the UK Biobank) to meaningfully stratify individual risk. In real-world terms, individuals with the highest polygenic risk scores—those in the top 20%—are found to account for a significant portion of cancer diagnoses, with some studies showing up to 30% of cancers in certain types being linked to these genetic markers, especially when combined with lifestyle and clinical data.

Key technological breakthroughs have been instrumental in this evolution. Liquid biopsies—using blood or other accessible biological fluids—offer a minimally invasive means of accessing the body's molecular landscape. These assays can detect circulating tumor DNA (ctDNA), which enables sensitive mutation and methylation profiling and fragmentomics; circulating tumor cells (CTCs), whose rarity and heterogeneity provide both diagnostic and prognostic information; and small RNAs, such as miRNAs or exosomal RNAs, which act as molecular reporters of the tumor and its microenvironment. Clonal hematopoiesis of indeterminate potential (CHIP) is becoming recognized as an important biomarker that could indicate a higher cancer risk. Proteomic analyses can uncover distinct host response patterns, while profiling of microbial DNA and metabolites, particularly from the gut, can illuminate contributors to inflammation and immune dynamics relevant to early carcinogenesis.

Artificial intelligence and machine learning increasingly underpin the interpretation of these vast, complex datasets, enabling the recognition of subtle, multivariate patterns in molecular data that can signal risk well before clinical presentation. This computational power is essential as we move beyond single markers towards true multiomic and integrative risk assessment, capable of capturing the many interconnected pathways of cancer biology.

This mechanistic and individualized approach to prevention is not limited to surveillance. Early identification of at-risk individuals permits a full spectrum of interventions. These may include rapid escalation to diagnostic imaging or tissue sampling, but also extend to lifestyle optimization, pharmacological prevention (such as low-dose aspirin in chronic inflammation-driven malignancies), and, crucially, immunoprevention. The substantial reduction in cervical, anogenital, and liver cancer incidence following the implementation of HPV and HBV vaccination programs is perhaps the most striking demonstration to date of how altering a specific pathogenic process can dramatically reshape the population burden of cancer.

Multi-cancer early detection (MCED) tests are the new avenue and broad lens for early detection. Based on advanced molecular diagnostics, they can detect minimal quantities of suspicious material and even identify the origin of the incipient cancer.

In the progress of MCED to routine tests, there remain important operational and ethical challenges. While highly specific, they often lack sensitivity for true early-stage disease, and an increased probability of false positives can lead to overtreatment or unnecessary anxiety. Integrating vast molecular and clinical datasets raises questions about standardization, equitable access, and the protection of personal health data. It is vital that these technologies are developed in ways that address rather than amplify existing disparities in cancer outcomes.

The emerging cancer combination early detection and interception paradigm that we present does not seek to supplant established screening and therapeutic strategies; rather, it aims to augment them. By combining new layers of molecular and clinical data, this model can identify individuals at the highest risk, guide early intervention strategies, and, ultimately, reduce the number of cancers that are diagnosed at later, more difficult-to-treat stages.

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What About Them, the Caregivers?

By Adrian Pogacian

"The anticipatory fear that I had become reality when the doctor said that my 6-year-old son must undergo chemotherapy…the rest of the explanation I didn't hear due to the shock that I had, even though I am a radiology nurse myself," the mother of a young cancer patient recalled, her voice breaking with emotion.

What do cancer patients feel? It's often said that every patient receives two diagnoses: one medical, and one psycho-emotional. Yet, all too often, we forget that this dual burden is also carried by those closest to them, the caregivers.

Cancer is never a solitary journey; it is a family and community affair. As healthcare professionals, we must look beyond the biomedical model. Our mission is not only to treat disease but to create conditions where every patient, regardless of background, has access to supported, holistic care, from local to global, and back again.

In this pursuit, caregivers must not be overlooked. Their role is not peripheral but central. Yet their contributions are frequently rendered invisible by systems designed primarily around the patient.

Who is the Caregiver?

The term "caregiver" may seem straightforward, yet it often creates confusion. In oncology, a caregiver is typically a family member or close friend, a parent, sibling, spouse, child, or neighbor, who provides unpaid emotional, physical, and logistical support to someone facing a life-altering illness.

As Applebaum (2024) outlines, caregiving responsibilities span three key areas:

1 . Activities of Daily Living (ADLs) – Assisting with bathing, dressing, mobility. These tasks can be physically demanding and often require training.

2 . Instrumental Activities of Daily Living (IADLs) – Managing groceries, transportation, finances, and other household responsibilities that are essential for independent living.

3 . Medical and Nursing Tasks – Administering medications, monitoring symptoms, and communicating with healthcare teams, responsibilities that many caregivers assume without formal instruction or adequate support.

As care shifts increasingly from hospitals to homes, families are expected to perform tasks once reserved for professionals, often without proper education or resources. The toll is deep and far-reaching.

"I can't accept that my child is ill. Therefore, it was so hard for me to learn the role of caregiver," a mother of a young cancer patient shared. "I thought being just a mother would be enough, but an oncological disease is far more than love and hope. It's like an administrative issue too…and this is exhausting for me."

This sentiment echoes the hidden, often overwhelming responsibilities that come with caregiving, tasks that extend beyond emotional support to managing the logistics and bureaucracy of medical care.

Caring for Yourself to Care for Others

An often-overlooked truth: taking care of yourself is not selfish, it's essential. Caregivers who neglect their own well-being risk burnout, poor decision-making, and health deterioration, all of which ultimately compromise the care they provide.

Prioritizing self-care allows caregivers to be emotionally present, resilient under pressure, and consistent in their role. As paradoxical as it may sound, caregiving starts with caring for oneself. This reciprocity is not indulgence; it's strategy, and it's necessary for long-term sustainability.

Michele Reynolds, a women's empowerment speaker and caregiver for her husband, who battles multiple myeloma, reflects on her experience: "As caregivers, the responsibility to hold it all together can feel overwhelming. I carried guilt for even the smallest breaks throughout the day. But over time, that guilt and stress showed up in my body as physical pain and complete exhaustion. I realized

I couldn't pour from an empty cup. Rest was not selfish, it was absolutely necessary."

Caregiving is, fundamentally, a balance between the psychological and logistical demands of the disease. Beyond emotional support, caregivers coordinate appointments, manage finances, track medications, and keep family and friends informed, all while maintaining their own lives.

As Jimmie Holland, MD, founder of psycho-oncology, emphasized, a caregiver is not merely a helper, but a "trusted companion" (Holland & Lewis, 2001). They offer stability in chaos, hope in fear, and consistency in uncertainty.

In my recent work on posttraumatic growth, I argue that the companion figure, the caregiver, is central to navigating trauma. And by extension, caregivers themselves deserve space to process and grow from the experience as well. Dr. Holland identified several fundamental obligations caregivers face:

1. Maintaining household stability
2. Sustaining family income
3. Coordinating additional support, such as aides or part-time care

These responsibilities often come at a steep personal cost. Caregivers frequently experience high levels of financial strain, career disruption, and health issues, with women bearing the brunt of long-term consequences.

"When faced with a cancer diagnosis, the financial burdens are overwhelming," Michele Reynolds explains. "The uncertainty of healthcare costs and time away from work makes support systems crucial."

The Hidden Rewards of Caregiving

Amid fear, fatigue, and sorrow, many caregivers also experience profound love, pride, and meaning. Even while navigating extreme stress, they find deep satisfaction in providing care to someone they love. This connection brings purpose and presence. "There are so many positives about being a caregiver," Reynolds adds. "Helping others feels deeply meaningful. You're making a profound impact on their lives. Through caregiving, you begin to recognize the strength within yourself and the confidence that grows as you witness the love and appreciation from your loved ones."

Michele Reynolds and her husband Mike

Positive emotions coexist with painful ones, and the central thread in the caregiver's journey is finding meaning in adversity. Caregivers transform loss into growth, routine into ritual, and burden into love. As Oscar Wilde once wrote, **"We live in an age when unnecessary things are our only necessities."** In an increasingly artificial world, love and hope remain our most human legacies.

Caregivers embody these qualities without expectation. They are living proof that empathy, connection, and presence cannot be replaced by technology. They must never be forgotten.

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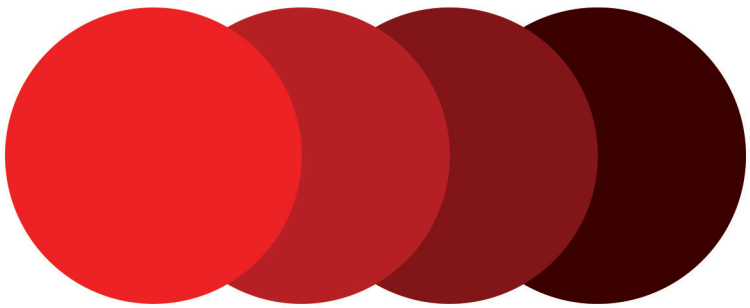
CANCERWORLD

Princess DINA

THE VOICE FOR THE VOICELESS



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The Voice For The Voiceless

Princess DINA

Her Royal Highness Princess Dina Mired of Jordan is recognized globally as one of the most influential voices in the fight against cancer and non-communicable diseases. A relentless advocate for equity in health, she has transformed cancer care in Jordan through her leadership of the King Hussein Cancer Foundation, and later brought that lived experience to the global stage as the first Arab and the first non-medical professional to serve as President of the Union for International Cancer Control (UICC).

Princess Dina has also played a historic role at the United Nations. In September 2011, she was elected to deliver the keynote speech on behalf of all civil society at the opening of the UN General Assembly's first-ever High-Level Meeting on non-communicable diseases (NCDs). In September 2018, she was once again chosen to speak at the third High-Level Meeting on NCDs as an "Eminent Champion of the Fight against Non-communicable Diseases."

Known for combining systems thinking with the authenticity of being a mother of a cancer survivor, Princess Dina has been a driving force in changing how the world views cancer—not as a privilege of the few, but as a universal right. Her global leadership has been recognized with numerous awards, including being named in 2023 as one of the "100 Influential Women in Oncology" by OncoDaily, receiving the Centenary Medal from His Majesty King Abdullah II in 2022, the WHO "World No Tobacco Day" Award in 2021, and the International Agency for Research on Cancer (IARC) Medal of Honour in 2015.

Today, through her many roles and her own podcast Global Health Dialogues, she continues to champion equity, amplify patient voices, and push for global solidarity to ensure that no patient is left behind—whether in high-income countries, low-resource settings, or conflict zones.

Personal Journey

1. Your Royal Highness, you are recognized globally as a relentless advocate for cancer control. As a member of the Jordanian Royal family, you have had a unique platform to influence change both at home and on the global stage. Your career spans humanitarian work, health advocacy, and international diplomacy. For those less familiar with your journey, could you share the turning point that inspired you to dedicate your life to this cause?

Thank you for this question. While being a member of the Jordanian royal family has given me a platform, my path into cancer advocacy was not born of privilege but of necessity.

I often say, **"I didn't choose cancer. It was never on my radar. But cancer chose our family..."** Our son was diagnosed with leukemia at barely two years old, and in that moment, I became, like everyone else, **a mother battling cancer with her child**. However, I also recognised that we were of the lucky few, who at the time could access treatment for their son abroad at one of the best cancer centers worldwide. It conflicted me to think about all those millions of other parents who did not have that chance to offer a lifesaving treatment for their children?

The title most reassuring is am—**the mother of a cancer survivor**—a title I wear with profound gratitude and responsibility.

That personal journey opened my eyes to the profound inequities faced by patients and families. I realized that if I, with access and resources, could struggle so much, then what of those with far less? That realization became my lifelong mission.

KHCF

2. You led the King Hussein Cancer Foundation for 15 years, transforming it into a world-class institution and playing a pivotal role in the development of the King Hussein Cancer Center, now recognized as a world class institution for cancer treatment. What lessons from that journey continue to shape your thinking today, and what was the most challenging part of leading such a transformation?

When I assumed leadership at the King Hussein Cancer Foundation, the landscape of cancer care in Jordan was starkly different from what it is today. Cancer was still spoken of in hushed tones—people referred to it simply as **"that disease."** The King Hussein Cancer Center itself was viewed more as a terminal ward than a place of recovery. Our greatest challenge was to change both the perception of cancer and the system of care that supported patients.

We knew that to build trust, we had to deliver quality care so that people can believe that they

can actually survive cancer. During my tenure as CEO, we mobilized more than $360 million—not as charity, but as a national and regional investment in survival and dignity. With those resources, we built a world-class institution that saves lives, not only for Jordanians but also for patients across the region. But the transformation wasn't just about bricks and mortar—it was about shifting culture, policy, and expectations.

One of the most important lessons I carry from that journey is that stigma is as dangerous as the disease itself. If patients and families are too ashamed or afraid to seek care, survival rates will never improve. We worked hard to normalize conversations about cancer and spread a message of hope.

Just as crucial was ensuring local ownership, careful planning, and a clear focus. We did not simply import a model from abroad; we built a system rooted in Jordan's needs, capacities, and realities. That sense of ownership gave people pride, strengthened accountability, and secured long-term commitment.

Another enduring lesson is that transformation is never a solo endeavor. It was the dedication of communities, governments, philanthropists, medical professionals, and patients themselves that made progress possible. I must emphasize that none of this would have been achieved without the extraordinary team at the Foundation and the Center. It truly was a team effort. From board members, doctors, and nurses to fundraisers, administrators, volunteers, everyone shared one vision: that Jordan deserved a cancer center on par with the best in the world, and that our patients deserved nothing less.

Finally, I learned that leadership in cancer control demands both resilience and compassion. You have to be strong enough to withstand resistance, but also human enough never to lose sight of the people at the heart of the mission. The most difficult part was living through the gap between vision and reality—seeing patients, especially children, suffer while we were still building the infrastructure that could save them. That was heartbreaking, but it was also my greatest source of motivation.

Today, when I see the King Hussein Cancer Center recognized as a global model for excellence, I feel both humbled and affirmed. It is proof that with determination, teamwork, local ownership, and a clear focus, we can build systems of world-class cancer care even in regions where people once thought it could not be done.

UICC

3. In 2016, you were elected to lead the largest Global Union for Cancer Control- Union for International Cancer Control (UICC). As the first Arab and the first non-medical professional to lead UICC, how did you bring a fresh perspective to a field often dominated by medical and technical voices?

When I was elected to lead the Union for International Cancer Control (2018-2020), I knew I was bringing something different to the table. I was not a doctor or a scientist. I came as the mother of a cancer survivor, someone who had walked every step of the journey with my child—from diagnosis, through treatment, through fear and hope. That gave me something that cannot be learned in textbooks: the patient perspective, rooted in lived experience.

At the same time, I had also been part of the team that transformed cancer care in Jordan, a middle-income country where we had to build systems almost from scratch. That work taught me about the very real challenges—financial, social, and systemic—that patients and providers face in resource-constrained settings. But it also showed me the opportunities: that with vision, planning, teamwork, and local ownership, you can deliver world-class cancer care even in places where people once thought it impossible.

So when I became President of UICC, I brought not only advocacy but credibility. I was speaking as someone who had lived on both sides of the fence: as a mother navigating the system both abroad and in Jordan, and as a doer helping to build one. That dual perspective allowed me to say to ministers, donors, and experts: "This is not just theory. This is what works, this is what hurts, and this is what patients need."

I also understood that health today is delivered by systems. It is no longer about one heroic doctor—it's about prevention, early detection, treatment, palliative care, and navigation all working together as part of a functioning whole. And because of my platform, I was able to take this lived experience and amplify it to a much larger global audience.

That, I believe, was my real contribution: bringing humanity, authenticity, and practical experience

into a field too often dominated by statistics and academic theory, and insisting that the voices of patients and the realities of low- and middle-income countries must sit at the center of the global cancer agenda.

Equity

4 . During your presidency at the Union for International Cancer Control (UICC) 2018- 2020, you made equity a central priority, especially in addressing the urgent needs of low- and middle-income countries. From your perspective, what are the most persistent inequities in cancer control between high- and low-resource settings, and what strategies or opportunities do you believe are most effective in closing these gaps? And how do you think the international community can bridge it?

Equity was always at the heart of my presidency at UICC. The numbers speak for themselves: 70% of global cancer mortality occurs in low- and middle-income countries, yet these countries have the least access to early detection, diagnostics, treatment, and palliative care. That stark reality made it very clear to me—this is where the work must be done.

As we speak, the inequities remain persistent and painful. In high-income countries, survival for childhood leukemia can reach 90%, while in parts of Africa it is as low as 10%. It is not because the science is different, but because the systems are absent—there are no diagnostics, no medicines, no radiotherapy, and no trained staff in many settings. This is a moral injustice that we absolutely must never accept.

The heart of the inequity issue starts with how we frame health—and cancer in particular. Closing these gaps requires a shift in multiple mindsets. We must stop seeing cancer care in LMICs as "too expensive" or "too complicated." Too often, health is seen as a cost rather than as an investment. That mindset alone creates a huge barrier, especially in low- and middle-income countries, because it discourages governments and partners from committing the resources and strategies needed to build strong cancer systems.

Another mindset that urgently needs to change is the fragmented way governments often approach cancer control.Cancer as a disease operates comprehensively—seizing every opportunity to spread and take lives. Yet, too often, our response is siloed, piecemeal, and disjointed, leaving the door wide open for cancer to continue its deadly work. What good is it to expand treatment if, at the same time, you ignore prevention—like the fight against tobacco, which remains the leading cause of cancer worldwide? And what good is it to fix treatment whilst failing to tackle late diagnosis and neglecting to build systems for early detection? Any lapse of action across the continuum of care only fuels cancer.

Another challenge is that health systems rarely borrow from the business world when it comes to solving problems. In other sectors, planning, metrics, and efficiency tools are second nature. Yet in health—and particularly in cancer control—we often overlook these. We focus on the money alone, rather than on the systems, governance, and planning structures that ensure every dollar is used effectively.

This is where I believe the greatest opportunities for progress lie. Yes, cancer control requires resources, but it is not just always about lack of money. It is about creating sustainable governance structures, finetuning systems, and designing patient navigation routes so that individuals do not get lost in fragmented care. It is about identifying and addressing bottlenecks—whether in diagnostics, workforce, or supply chains—and building accountability into every step of the process.

And here, the role of the global donor community must be acknowledged. Whilst local accountability and ownership are crucial, the global donor community also has a responsibility to align with local cancer control plans. Too often, well-meaning donor programs skew or even disrupt local planning, causing duplication and pulling focus away from national priorities. This is one of the main reasons many LMICs—especially in Africa—have been delayed in building sustainable cancer infrastructure. Global health aid historically flowed toward infectious diseases, leaving cancer and other non-communicable diseases largely unsupported.

If we are to close these inequities, the global donor community must evolve from short-term, vertical programs to long-term, system-building partnerships that strengthen local capacity. Equity will not come from charity or from imposing outside agendas. It will come from respecting local priorities, investing in sustainable systems, and treating health as an investment in people, dignity,

and development.
If the international community truly wants to make an impact, it must commit to long-term partnerships that strengthen local ownership, empower local professionals, and ensure that every patient—regardless of where they live—has the chance not just to fight cancer, but to survive it.

UHC

5. You have been a strong advocate for integrating cancer treatment into universal health coverage. From your perspective, what progress has been made in this area, and what challenges still remain? You often speak of the "invisible cost of delayed diagnosis." How can global health systems better integrate early detection and diagnostics—not only as a matter of equity, but also as a cost-effective strategy?

I have always believed that if we are serious about equity, cancer treatment must be integrated into universal health coverage. We cannot call health "universal" if it excludes one of the leading causes of death worldwide.

But the challenges remain immense. Too often, cancer is still treated as a privilege rather than a necessity. This is why I always say, "everyone is poor before cancer." No matter your income level, when cancer strikes, the costs are catastrophic. Families, especially in low- and middle-income countries, are devastated by out-of-pocket expenses—selling their homes, depleting their savings, or abandoning treatment altogether because they simply cannot afford it. That is one of the deepest inequities we must confront.

When a country is truly serious about implementing UHC, it must first restructure the health systems they inherited, which were designed decades ago mostly to respond to infectious diseases. That means going beyond patchwork fixes and instead addressing inefficiencies, bottlenecks, and gaps across the entire continuum of care. It also means updating and finetuning systems with the tools we have today—such as digital health and artificial intelligence—to improve diagnostics, streamline patient navigation, and ensure continuity of care. Most importantly, it means designing systems that are adapted to the needs of people, rather than forcing people to adapt to fragmented systems. UHC will deliver the intended results when implemented on an efficient running system.

This is why I often highlight the "invisible cost of delayed diagnosis." The price is not only in lives lost but in the much higher financial burden of treating late-stage disease compared to catching it early. A woman diagnosed with breast cancer at stage I can often be treated at a fraction of the cost of treating advanced disease, with a far greater chance of survival.

So the way forward is clear: integrating early detection and diagnostics into UHC as a central pillar, strengthening governance and accountability, and rethinking health spending not as a drain but as a smart investment in people, dignity, and national productivity. If we ignore this, cancer will always remain "too expensive." But if we build systems that are modern, people-centered, and equity-driven, we can save both lives and resources—and make universal health coverage truly universal.

My own country Jordan is undergoing a complete overhaul of its UHC plans and there are encouraging examples—such as Georgia, which integrated diagnostics into its UHC package and doubled access to cancer care—proving that when governments prioritize cancer, progress is possible.

Childhood Cancer

6. Childhood cancer survival rates remain starkly unequal worldwide. As former Patron of SIOP, How do you see initiatives like WHO's Global Initiative for Childhood Cancer changing the landscape, and what role do patient advocacy and philanthropy play in this fight?

Childhood cancer is one of the most heartbreaking examples of inequity in global health. In high-income countries, survival rates for childhood cancers like leukemia can reach 80–90%, while in some low-income countries they can be as low as 10%. The science is not different—the children are not different—the difference is access to timely diagnosis, treatment, and supportive care. And as I often say, a child's chance for treatment should not be an accident of geography.

This subject is also deeply personal for me as the mother of a cancer survivor. I could not imagine, even for one second, knowing that a miracle drug exists that could save my child—but that it was not available to me because of where I lived or by how much is in my bank account. Yet this is the daily tragic reality for countless parents across the developing world. That moral injustice is what

drives me, and it is why I will never stop speaking about childhood cancer.

But here is what troubles me deeply: childhood cancer should never be treated as a siloed, stand-alone issue. We should not have to advocate for saving the life of a child as if it is somehow separate from the right to deliver lifesaving treatment to an adult. Many underfunded diseases and patients suffer precisely because of this fragmented, "chopping up" approach—where we put people into categories instead of building health systems that serve everyone. What we need is comprehensive, people-centered cancer care across the life course, not labels that divide and dilute action.

This is why initiatives like the WHO's Global Initiative for Childhood Cancer are vital: they put the issue on the global health agenda in a way it has never been before, while also helping countries design national strategies, build capacity, and strengthen systems step by step—whether through training health workers, improving access to diagnostics, or ensuring essential medicines are available. But if we are to truly accelerate the fixing of childhood cancer, the global community must support the WHO initiative with the full might of its resources—financial, technical, and political. Only then will we give every child, everywhere, a fair chance at survival.

Partnerships

7. Partnerships have been a hallmark of your work—you have spoken about the role of St Jude and the City Cancer Challenge model and many others . In your view, what makes a partnership transformative rather than transactional?

Partnerships have been central to my work, whether through global collaborations with St. Jude or innovative models like City Cancer Challenge. But I have always believed that there is a profound difference between a transactional partnership and a truly transformative one.

A transactional partnership is often short-term, donor-driven, and focused on ticking boxes. It can even disrupt local systems by duplicating efforts or imposing outside priorities. In contrast, a transformative partnership starts with listening to local needs and aligning with local plans. It respects national ownership, builds capacity rather than dependency, and leaves behind something sustainable long after the international partner is gone.

I often say that I credit St. Jude for standing with us from the very beginning. From 2002 until today, St. Jude has been an extraordinary partner to the King Hussein Cancer Foundation and Center. They opened their doors to us—training our doctors and nurses, offering fellowships, providing lifesaving second opinions, and much more. Personally, I can say that I learned everything I needed to know about how to build the foundational work for King Hussein Cancer Foundation from St. Jude and ALSAC. That is the essence of a partnership that transforms lives and institutions.

I also deeply admire the work of Partners In Health and the late Dr. Paul Farmer, particularly in Rwanda. He showed the world that even in the most resource-constrained settings, it is possible to deliver world-class care if you invest in systems, train local staff, and—most importantly—treat patients with dignity. But what made Rwanda's story so remarkable was not only PIH's commitment—it was the Government of Rwanda's vision and leadership. The government prioritized health, embraced partnership, and built policies that enabled long-term sustainability. Without that level of government ownership and accountability, even the best-intentioned partnership would have struggled. Rwanda today stands as a model of how global solidarity combined with national leadership can achieve lasting change.

What makes a partnership transformative is not the size of the funding, but the quality of the relationship: trust, mutual accountability, and a shared vision.

At City Cancer Challenge, for example, the beauty of the model is that it empowers cities themselves to define their cancer priorities, while partners bring expertise, resources, and solidarity. Similarly, with St. Jude and Partners In Health, their work is powerful precisely because it is about building global capacity, not just exporting a single program.

For me, the litmus test is simple: does the partnership strengthen systems, empower local actors, and improve equity of access for patients? If the answer is yes, then it is transformative. If not, it risks becoming just another transaction in a world where patients cannot afford time or wasted effort.

8. As Honorary Patron of European Organisation for Research and Treatment of Cancer (EORTC) tell us about your advocacy for global access to clinical trials.

As Honorary Patron of EORTC, a role I proudly took on after His Highness Prince Albert of Monaco, my message is simple: clinical trials are not a privilege, they are a right. They represent hope, often the only hope, for patients when standard treatments fail. Yet today, access is still concentrated in high-income countries, leaving patients in the Global South.

As Patron, we are working with EORTC to expand access to the MENA region, building a sustainable governance structure that ensures that the MENA region is not only involved in European clinical trials, but that we also begin to develop our own trials in the future—trials that reflect our own cancer burden and our own populations.

We must all break this inequity. Trials should not depend on your postcode. They must be integrated into health systems everywhere, designed with patient voices at the table, and supported so that results reflect the diversity of the real world. Only then can we truly say science is serving humanity, not just a privileged few.

Humanitarian Response & Cancer in Conflict Zones

9. You have spoken with urgency about the plight of cancer patients trapped in conflict zones like Gaza and in refugee settings—people who are often invisible in humanitarian responses. What does it mean, in real terms, to uphold the right to cancer care in the middle of such crises? And how can the global cancer community ensure that non-communicable diseases like cancer are no longer sidelined or sacrificed in humanitarian health responses?

When we speak about the plight of cancer patients in conflict zones, we must first confront a brutal truth: cancer does not stop for war, borders, or bombs. A bullet may miss you, but cancer will not. And yet, in humanitarian responses, cancer patients are treated as though they do not exist.

Think of the definition of "safety" for a refugee. If you need blankets, food, or temporary shelter, then perhaps safety can be delivered. If you are injured and require trauma care, eventually safety can be delivered. But if you are a refugee with cancer, your definition of safety is obliterated. You may have escaped the violence outside, but the violence inside your body—cancer—continues its deadly work, with no chemotherapy, no radiotherapy, no surgery in sight. In those moments, safety is not yours. It belongs to cancer itself.

The war in Ukraine was a seminal moment for many of us in global health. For the first time, we witnessed unprecedented solidarity—first ladies, hospitals, and governments in neighboring countries working hand in hand to evacuate cancer patients and ensure their continuity of care. It was a hopeful step, a long overdue recognition that cancer patients must be part and parcel of emergency response.

And then came October 2023, and the genocide in Gaza. What little remained of humanitarian law and infrastructure was not just violated, but razed to the ground . The most basic tenets of emergency relief—food, water, shelter, medical access—were systematically denied to two million civilians. Hospitals, ambulances, pharmacies, even UN and Red Cross facilities, were targeted and destroyed. Doctors and other health personnel were killed or abducted. The Geneva Convention itself was buried under the rubble of Gaza.

Even before October, the cancer landscape in Gaza was grim. For 17 years, a blockade restricted movement of people and goods, stripping hospitals of medicines, equipment, and personnel. Radiotherapy—the cornerstone of modern cancer treatment—was denied altogether. Patients endured endless obstacles: shortages of drugs, no specialists, and Kafkaesque exit permits, with nearly half denied the chance to seek treatment outside. Many died from avoidable deaths.

But after October 7th, the situation descended into utter barbarity. The newly built Turkish cancer hospital was decommissioned. The pediatric cancer ward of PCRF was bombed. Cancer patients in Gaza now have no safe passage, no treatment, and no hope.

This is not only a failure in humanitarian relief infrastructure but a collapse of humanity itself. By stripping civilians of health protection during conflict, the world has set a dangerous precedent. Warlords everywhere are watching. They have learned that health can be weaponized with impunity, that patients can be starved, denied care, and bombed without consequence.

We cannot, as a global community, allow Gaza to become the model for future humanitarian response.

We must reclaim equity and the sanctity of health as non-negotiable rights—for Palestinians, Ukrainians, Syrians, Yemenis, Sudanese, Armenians and all other refugees... even for the devil incarnate. and indeed for all civilians caught in war. Health must never again be a weapon of war.

I call for breaking the *cancer of silence*, I call for solidarity. We must demand that health protection in conflict is not optional, not selective, not conditional. What has happened in Gaza and is still happening must never be repeated. Not here, not anywhere. Not ever.

Leadership: Gender Equity

10. As a woman leader from the Global South in global health, what barriers have you encountered, and how have you transformed them into opportunities for change? And what advice would you offer to the younger generation following in your footsteps?

As a woman leader from the Global South, I have faced many barriers—some visible, many invisible. Often, in international forums, you feel that your voice must work twice as hard to be heard, and that your experience is sometimes measured against standards set elsewhere, usually in the Global North. I have also seen how women's leadership is too often underestimated, or placed in a "supportive" role, rather than acknowledged as a driver of change.

But I believe in turning barriers into opportunities. Coming from Jordan and the MENA region, I brought perspectives and lived experiences that were missing from global health conversations. I spoke not from theory, but from practice—having led the transformation of the King Hussein Cancer Foundation, and having lived the journey of being a mother of a cancer survivor. These experiences gave me credibility and allowed me to speak with authenticity. Instead of seeing my background as a limitation, I used it as my strength.

Another challenge has been that cancer and NCDs in the Global South were often sidelined by the global health agenda. But rather than accept that, I pushed to put them on the map—arguing that we cannot talk about "universal health" while excluding the diseases that devastate most families in our region. Serving as the first Arab and first non-medical professional to lead UICC gave me a platform to challenge these imbalances and advocate for equity.

To the younger generation, my advice is this: do not wait for permission to lead. Your lived experience is your power. Use your voice, speak your truth, and don't be afraid to push against systems that tell you to wait your turn. Leadership is not about where you come from—it is about what you stand for, and how relentlessly you pursue it.

Most importantly, remember that no leader succeeds alone. Build teams, nurture partnerships, and lift others as you rise. The world needs young leaders—especially from the Global South—who are fearless, compassionate, and equity-driven.

11. Your Royal Highness, you have recently started your own podcast, "Global Health Dialogues with Princess Dina" in collaboration with Oncodaily; what prompted you to do that?

For many years, I was always the interviewee. And I often felt that some of the most relevant questions I wanted to be asked never came and if they did one only had time for a sound bite. So, I decided it was time to turn the tables, to become the interviewer myself—so that I could bring forward the questions that matter, and shine a light on the issues, voices, and innovations that too often go unheard.

The idea behind *Global Health Dialogues with Princess Dina really* came from my belief that we need to break down the walls between policy, science, and lived experience. Too often, global health conversations happen in silos—among experts, policymakers, or donors—while the voices of patients, practitioners, and communities are left out. I wanted to create a platform where all those voices in the healthcare ecosystem could meet, and where stories and strategies could be shared openly and accessibly.

Working with Oncodaily gave us the right partnership to bring this to life. Together, we wanted to build a space that is not only about exchanging knowledge but about inspiring action. Every episode is designed to spotlight in a deep dive both challenges and solutions—always through the lens of equity. For me, this podcast is about connection—connecting people, ideas, and hope. Because if we are serious about achieving equity in health, then we must listen to each other and learn from each other.

SOCIAL MEDIA IN ONCOLOGY

Between Empowerment and Risk

By Ina Suppan

In oncology, communication has always been central – but in the digital age, it increasingly unfolds online. Platforms like Instagram, TikTok, Facebook, and X have become arenas where cancer journeys are shared, interpreted – and sometimes dangerously distorted. For patients living through one of the most vulnerable phases of their lives, social media can empower or endanger.

The Supportive Side: Empowerment, Connection & Access to Knowledge

Digital communities can reduce isolation and provide both emotional and practical support. A 2021 study involving young adults aged 18–39 found that online peer support reduced feelings of isolation and validated emotional and practical needs, especially where in-person networks were inaccessible [1].

A 2023 meta-analysis of 6,239 patients across 11 countries showed that social-media-based interventions improved quality of life ($g = 0.25$) and significantly reduced anxiety ($g = -0.41$) [2]. Qualitative studies with breast cancer survivors further underscore the value of online spaces that provide practical tips, emotional relief, and peer connections [3].

One young breast cancer survivor put it simply: "Connecting with others who understood the side effects and the emotional burden helped me feel less alone."

These positive experiences align with the mission of the European School of Oncology (ESO) to educate, connect, and empower professionals – and, through them, patients [10].

The Dark Side: Misinformation & Digital Risks

Social media is not a neutral space. Analyses from the University of Bologna show that between 88% and 100% of cancer-related content on YouTube and TikTok is inaccurate or misleading [5]. These range from "miracle cures" and extreme diets to harmful practices like coffee enemas or unapproved infusions.

The American Society of Clinical Oncology (ASCO) has documented cases where patients delayed or refused evidence-based treatments in favor of social-media-promoted alternatives – with sometimes fatal outcomes [4]. Even well-intentioned content can cause harm: uplifting TikTok videos that omit realities such as nausea or fatigue may set unrealistic expectations, leaving those with different experiences feeling inadequate [6].

The Role of Healthcare Professionals – Especially Nurses

Oncology nurses, among the most trusted professionals, are increasingly using social media to share evidence-based information and advocacy [7]. Many use the THINK framework – True, Helpful, Inspiring, Necessary, Kind – to ensure credibility.

As one nurse reflected: "We need to balance empathy with evidence. Our digital voice matters."

Real-world examples highlight this potential:
- Shanon Nealon, an Australian patient and later nurse consultant, documented her chemotherapy journey with dance videos on TikTok alongside her father – blending honesty, humor, and education to inspire others [8].
- Alex Lawless, a breast care nurse, supported a young patient both online and offline, providing practical and emotional support that helped preserve dignity and self-esteem during treatment [9].

Why Clinicians Cannot Remain Silent

Misinformation spreads quickly online. Silence from health professionals leaves a vacuum that others will fill. Therefore, oncologists and nurses should use social media to:
- Share evidence-based, compassionate content.
- Explain treatments, side effects, and mental health resources.
- Teach digital health literacy.

Strategies for Responsible Digital Engagement

1. Integrate digital health literacy into patient education – not as an optional add-on but as a core element.
2. Empower oncology professionals online through institutionally supported roles, training, and ethical guidelines.
3. Build partnerships with credible patient advocates.
4. Develop national or regional strategies to combat misinformation, including monitoring and evidence-based counter-communication.
5. Tell stories with context – combining personal narratives with professional framing for emotional and informational impact.

Hospitals and professional societies could formalize roles such as "Clinical Social Media Liaison" or provide incentives for quality online contributions. Such measures not only protect patients but also strengthen trust in healthcare.

Between Culture and Responsibility

Social media is more than a tool – it is a culture where speed can trump accuracy and popularity can outweigh evidence. In this environment, oncology professionals must act as guides rather than gatekeepers. They should share reliable information, amplify patient voices, and correct falsehoods when necessary.

Initiatives like the American Cancer Society's Digital Ambassador Program or the Royal College of Nursing's social media training modules show how professionals can be empowered to engage safely and effectively. ESO is ideally positioned to support such developments across Europe.

Previous ESO College Voices winners have shown how personal storytelling combined with professional insight can highlight disparities, innovations, and the human side of oncology. These experiences reinforce that dialogue, evidence, and empathy remain the foundations of good oncology – both offline and online.

Conclusion

Whether lifesaving or life-risking, the impact of social media in cancer care depends largely on whether qualified voices engage in the conversation. In a world where digital narratives can influence clinical decisions, silence is not an option.

The oncology community faces a choice: passively leave the digital space to others, or actively shape it with clarity, compassion, and critical thinking. Only the latter ensures that social media becomes a force that strengthens, rather than undermines, those facing one of life's greatest challenges.

Acknowledgment

This article was written by Ina Suppan, one of the two winners of the ESO College Voices Contest 2025, on the topic "Social media: friend or foe for cancer patients?".

Dr. Ina Suppan

This year's contest once again proved that doctors can also be excellent cancer writers. We received 27 proposals from ESO College members across 20 countries, each exploring the chosen theme.

After careful deliberation, guided by CancerWorld's editorial standards, as well as criteria of clarity, relevance, originality, potential impact, and our hallmark style of weaving in interviews and firsthand perspectives, Dr. Suppan was selected as one of the winners, and we are proudly publishing her impactful voice.

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FROM OCEANS TO ORGANS

The Alarming Cancer Risks of Microplastics

By Aharon Tsaturyan

Given the global estimate that approximately 9 to 14 million metric tons of plastic enter the oceans yearly—continuing to fragment into microplastics (MPs)—the urgency to understand their potential health effects has escalated. Particularly concerning is the growing body of evidence that MPs contribute to biological processes linked to cancer development, such as chronic inflammation, oxidative stress, and genetic damage. Therefore, analyzing the cancer risks posed by microplastic exposure is critical for informing public health strategies and mitigating the long-term impacts of our plastic-laden environment.

Microplastics are defined as synthetic solid plastic particles typically smaller than 5 millimeters in size, ranging from about 1 micrometer to 5 millimeters, with either regular or irregular shapes. According to the International Organization for Standardization (ISO) and environmental research published by the American Chemical Society, MPs include both primary microplastics—those intentionally manufactured at microscopic sizes such as microbeads used in cosmetics, industrial plastic pellets (nurdles), and synthetic textile microfibers—and secondary microplastics, which are formed unintentionally through the fragmentation and weathering of larger plastic debris in marine and terrestrial environments (Frias and Nash, 2019; Wang et al., 2023)

Alarmingly, microplastics have been detected inside human tissues, including the lungs, colon, liver, and even the placenta. Scientific analyses reveal MPs can translocate into organs due to their small size, which facilitates passage through biological barriers. Their presence has been confirmed not only in human feces but also in vascular and cancerous tissues, highlighting a direct exposure route from the environment to the human body.

MPs are widespread pollutants found in diverse environmental compartments, especially aquatic systems such as oceans. Studies estimate that ocean waters can contain up to thousands of microplastic particles per cubic meter, particularly in coastal regions where plastic pollution accumulates. Soils and sediments across various land use types globally have also shown significant contamination, with concentrations often reaching thousands of particles per kilogram of dry sediment, demonstrating MPs' pervasive environmental presence.

"The presence of microplastics in seafood and water supplies is alarming. While direct links to chronic diseases like cancer remain under investigation, their capacity to adsorb persistent organic pollutants could indirectly influence carcinogenic pathways."

Prof. Maria Wagner, Expert in Environmental Medicine

Swallowing, Skin Contact, and Even Inhaling

Exposure to MPs in humans occurs mainly via three pathways. Ingestion, through consumption of contaminated seafood and drinking water, **is a primary route, with studies reporting MPs present in 100% of human stool samples analyzed** (Wang et al., 2023). Inhalation of airborne microplastics—estimated to deposit hundreds of particles per square meter daily in urban environments—leads to MPs entering the respiratory tract (Catarino et al., 2024). Lastly, though less studied, dermal contact with MP-contaminated water and soil may contribute to exposure.

Recent findings indicate that MPs commonly smaller than 100 micrometers can penetrate biological barriers, enabling their accumulation in organs. MPs have been detected in human lung, vascular, and colorectal tumor tissues, suggesting their translocation from exposure sites into systemic circulation and potential involvement in pathological processes (Prata et al., 2023). This ability to infiltrate organs underlines growing concerns over their biological effects, including the potential to contribute to cancer risk.

Plastic Invasion: How Microplastics Are Taking Over Our Vital Tissues

According to recent studies, microplastics (MPs) accumulate significantly in human organs, with tumor tissues such as those in colorectal cancer often showing higher MP loads compared to adjacent non-cancerous tissues. For example, a 2025 study published in Nature Medicine reported that MPs, predominantly polyethylene (PE), polyvinyl chloride (PVC), and polyethylene terephthalate (PET), were found in large quantities within human liver, kidney, and brain tissues, with the brain exhibiting approximately tenfold higher concentrations than other organs (Campen et al.,

2025). This bioaccumulation trend appears to be increasing over time, with plastic concentrations rising about 50% in human brains over the past eight years according to research from the University of New Mexico (UNM) (Campen et al., 2025).

Besides the brain, MPs have been detected in the lungs, liver, placenta, bloodstream, and colorectal tumor tissues, pointing to widespread systemic accumulation. In human lung tissue, MPs were found at an average concentration of approximately 14 microplastic particles per gram, while vascular studies revealed MPs along blood vessel walls, potentially provoking chronic inflammation (Prata et al., 2023). Such widespread presence in key organs suggests MPs might affect multiple physiological systems simultaneously.

Moreover, microscopic examination of human tissues found that MPs often exist as nanoparticles or microscopic fragments smaller than 100 micrometers, which facilitates their capacity to infiltrate biological barriers and accumulate in organs (Campen et al., 2025). This infiltration can lead to tissue-level immune responses, oxidative stress, and localized toxicity, mechanisms known to contribute to carcinogenesis.

These findings underscore the urgency of understanding MP accumulation in human organs, as their pervasive presence alongside evidence of rising concentrations over recent years indicates a pressing health risk, particularly concerning cancer and other chronic diseases.

From Pollution to Proliferation: How Microplastics Drive Cancer Growth

According to recent scientific research, microplastics (MPs) induce several biological mechanisms that could contribute to cancer development. MPs are known to generate oxidative stress by increasing reactive oxygen species (ROS) levels in cells, which damages DNA, lipids, and proteins and impairs antioxidant defenses such as superoxide dismutase and glutathione (Corsi et al., 2024). This oxidative damage activates signaling pathways like MAPK, leading to inflammation and apoptosis dysregulation, which are classical hallmarks of cancer initiation and progression (Zhao et al., 2025). MPs also elicit chronic inflammation by triggering cytokine release and activating innate immune receptors such as toll-like receptors, contributing to a tumor-friendly microenvironment (Chen et al., 2025).

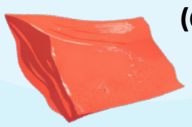
Moreover, MPs act as vectors for carcinogenic additives including phthalates and bisphenol A, chemicals that disrupt endocrine signaling and are associated with malignancies such as breast and prostate cancers (Wang et al., 2025). These endocrine disruptors interfere with cellular hormone regulation, facilitating aberrant cell proliferation in hormone-sensitive tissues.

Findings from animal and cellular models reveal that MP exposure accelerates cancer cell proliferation and tumor growth. For instance, experiments with polystyrene nanoparticles have demonstrated increased tumor burden in ovarian and breast cancer models, along with impaired immune responses within the tumor microenvironment (Chen et al., 2025). MPs also induce alterations in gut microbiome composition, which in colorectal cancer models leads to enhanced inflammation and tumor promotion (Zhao et al., 2025).

Though epidemiological data directly linking MPs to cancer in humans remain limited, these mechanistic insights from experimental models provide strong evidence for MPs' carcinogenic potential. According to a comprehensive 2025 review, the intersection of MPs' oxidative stress induction, inflammation, DNA damage, and endocrine disruption creates a conducive environment for cancer initiation and progression (Zhao et al., 2025). This growing body of evidence underscores the urgent need for further research to elucidate the long-term cancer risk of microplastic exposure in humans.

"Microplastics (MPs) and nanoplastics (NPs) are emerging pollutants... MPs and NPs have been intentionally placed in cleaning products, coatings, cosmetics, and medical applications. They are also created when items such as bottles, clothing, tires, and packaging break down in the environment. MPs and NPs can be transported into streams and seas, carried into the air, and fall with the rain. MPs also attract pollutants that may already exist in the environment at trace levels, accumulating toxins and delivering them to the wildlife that eats them, leading to bioaccumulation through the food chain."

Centers for Disease Control and Prevention (CDC), August 2024



From Fragments to Freedom: Reclaiming Our Earth and Health

Techniques such as Raman spectroscopy, Fourier-transform infrared spectroscopy (FTIR), and pyrolysis gas chromatography-mass spectrometry (Py-GC-MS) provide highly sensitive microplastic identification in complex biological samples (Phan et al., 2023). AI-assisted imaging, including convolutional neural networks (CNNs), automate detection and classification of MPs by processing spectral and visual data, offering rapid, high-throughput assessment with improved accuracy and scalability (Khanam et al., 2025). Hyperspectral imaging integrates chemical and spatial information, enabling detailed mapping of MPs in tissues.

Importance of Pollution Reduction

Reducing plastic pollution is critical to lowering environmental and human MP exposure, necessitating plastic waste management improvements and public awareness campaigns. Enhanced wastewater treatment technologies can capture MPs before they enter aquatic environments, mitigating contamination of food and water sources (Stanford Medicine, 2025). Regulations banning or limiting microplastics in personal care products and textiles contribute to source reduction.

"Health risks exist at all stages of the plastic lifecycle, from production and use to recycling and disposal, as well as from legacy plastics in the environment. Increasing evidence about the consumption and inhalation of micro- and nano-plastics, concerns over exposure to hazardous chemicals used to give plastics specific properties, and the need for better waste management practices are becoming central to public health discussions."

World Health Organization (WHO), August 2024

Call for Multidisciplinary Research

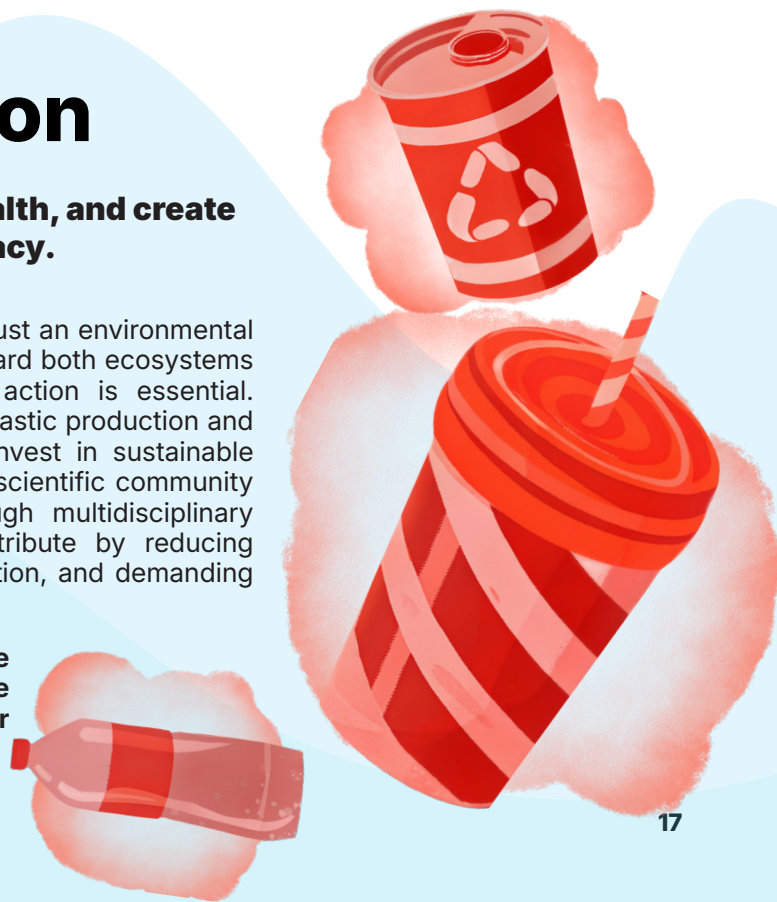
Comprehensive studies integrating epidemiology, toxicology, molecular biology, and environmental science are needed to clarify MPs' health effects and elucidate cancer risk pathways (Ribeiro et al., 2025). Longitudinal human cohort studies combined with advanced biomonitoring can help define causality and exposure thresholds. Coordinated global efforts are necessary to standardize detection methods and policy responses.

Call to Action

Let us reclaim our earth, restore our health, and create a future free of plastic's legacy.

The evidence is clear: microplastics are no longer just an environmental issue but a pressing public health threat. To safeguard both ecosystems and human health, immediate and coordinated action is essential. Policymakers must accelerate regulations to curb plastic production and ban unnecessary microplastics, industries must invest in sustainable materials and circular economy solutions, and the scientific community must unite to fill critical knowledge gaps through multidisciplinary research. Most importantly, individuals can contribute by reducing plastic use, supporting policies for cleaner production, and demanding accountability from corporations.

Protecting future generations requires collective responsibility—our choices today will determine whether microplastics remain a hidden hazard or become a catalyst for global change.



Could Radiotherapy Offer Unexpected Protection Against Alzheimer's Disease?

By Janet Fricker

Women who survive breast cancer may face a surprising advantage: a lower risk of developing Alzheimer's disease than their peers without cancer. The cohort study, published in JAMA Network Open, 20 June, found that breast cancer survivors had an 8% lower risk than controls and that the relationship was strongest for breast cancer patients treated with radiation therapy, whose risk was reduced by 23%.

"Breast cancer survivors commonly complain about cognitive decline, known as 'chemobrain', after cancer treatment. However, our study suggests that this does not result in an increased long-term risk of Alzheimer's disease," Su-Min Jeong, the first author, tells CancerWorld. "Rather than focusing on long-term cognitive decline, to prevent Alzheimer's disease, patients should be focusing on managing the other modifiable risk factors, like smoking and diabetes, identified in the study. Our results can be used by clinicians to reassure breast cancer patients concerned about the effects of treatment on their cognitive health."

Breast cancer survivors often report cancer-related cognitive impairment, such as difficulties with concentration and memory, both during and after cancer treatment. Previous studies exploring the risk of Alzheimer's disease among breast cancer survivors have produced mixed results. For example, a Swedish study published in Neurol Clin Pract in 2023 comparing 26,741 five-year breast cancer survivors and 249,540 women without cancer found a 35% increased risk of Alzheimer's disease among those diagnosed with cancer. In contrast, a Taiwanese study published in QJM in 2016 found no increase in the risk of dementia overall in breast cancer survivors compared with cancer-free individuals, but did show a 17% lower risk of dementia among women treated with tamoxifen.

Dong Wook Shin (Sungkyunkwan University, Seoul), Kyungdo Han (Soongsul University, Seoul), and colleagues have established an ongoing cohort study using data from the Korean National Health Insurance Service to evaluate the quality of life of breast cancer survivors. The current publication uses the cohort to investigate the association between Alzheimer's disease and cancer treatment. Altogether, a total of 70,701 patients who underwent breast cancer surgery between January 2010 and December 2016, were matched 1:3 with 302,712 cancer-free controls. Information on breast cancer treatment was obtained from claims data within one year of diagnosis. The primary outcome was the incidence of newly diagnosed Alzheimer's disease which was based on at least one prescription for anti-dementia medications (donepezil, rivastigmine, galantamine, or memantine).

In the study, the mean age of breast cancer survivors was 53.1 years. Overall, 72% received radiotherapy, 57% cyclophosphamide, 50% anthracycline , 47% tamoxifen, and 30% other endocrine therapies.
During a median 7.3 years follow-up, 1,229 Alzheimer's disease cases were observed among breast cancer survivors versus 3,430 Alzheimer's disease cases among cancer-free controls. This translated to an incidence rate of 2.45 Alzheimer's disease cases per 1000 person years for breast cancer survivors versus 2.63 Alzheimer's disease cases per 1000 person years for cancer-free controls, an 8% lower risk for breast cancer survivors.

When risk was analysed according to treatment modality, radiation therapy was associated with a 23% lower risk and anthracyclines a 14% lower risk. No association for Alzheimer's disease was found with trastuzumab and taxanes. With regard to endocrine therapy, no association was found for treatment with tamoxifen, aromatase inhibitors, or combined tamoxifen/ aromatase inhibitors. The reduced risk for Alzheimer's disease was no longer

significant one year, three and five years later.

Several risk factors were associated with a significantly higher risk for Alzheimer's disease: current smoking more than doubled the risk, diabetes increased it more than 1.5 fold, and chronic kidney disease more than tripled the risk. Notably, alcohol use, physical activity levels, and hypertension were not found to be associated with risk.

"Breast cancer survivors may have a slightly lower risk of AD [Alzheimer's disease] compared with cancer-free individuals, potentially influenced by cancer treatments, underscoring the need for further research on long-term neurocognitive outcomes in this population," conclude the authors. As the follow-up time increased, the lower risk of Alzheimer's disease disappeared. "We assume this is because the treatment effect of cancer may diminish over time," says Jeong. Additional studies with long-term observation periods, she adds, are warranted to examine long-term associations between Alzheimer's disease risk and breast cancer survival duration.

Why Might This Be Happening?

Cancer treatments, the authors speculate, may be helping to prevent the development of Alzheimer's disease in different ways. For example, an in vivo study published in Pract Natl Acad Sci in 1995 found that anthracycline treatment significantly reduced the formation of amyloid deposits, suggesting benefits may occur through inhibition of fibril growth and facilitated clearance of amyloid deposits.

Another theory is that small amounts of radiation used to treat breast cancer may incidentally reach the brain, slowing Alzheimer's-related changes.

Last year, a systematic review (involving 12 animal studies and four human studies), published in Int J Radiat Oncol Biol Physics, reported that low-dose radiation therapy reduced the number of amyloid plaques and neurofibrillary tangles, and had a role in the regulation of genes and protein expression involved in pathological progression of Alzheimer's disease. "Phase I/II/III trials are needed to assess the long-term safety, efficacy, and optimal treatment parameters of LDRT [low dose radiotherapy]in AD treatment," concluded the authors of the review.

Limitations of the current study, the authors acknowledge, include a lack of detailed information about breast cancer stage and the radiation dose and fraction that the patients received. Additionally, the number of Alzheimer's disease cases could have been underestimated based on the use of ICD-10 codes, and the inclusion criteria of survivors with operable breast cancer may have introduced selection bias (they were likely to be younger, without comorbidities and to have less advanced cancer).

The investigators believe that the lower risk of Alzheimer's disease among cancer survivors is likely to hold for other types of cancer. Indeed, a Framingham Heart study analysis, published in The BMJ in 2012, **found that survivors of any type of cancer had a 33% lower risk of Alzheimer's disease than age-matched controls without cancer.**

CancerWorld Comment

Overall, the study by Dong Wook Shin, Kyungdo Han, and colleagues contributes to understanding of 'chemobrain' in cancer survivors. Clinicians can use the findings of the study as evidence to reassure their patients that chemo and radiotherapy are unlikely to increase their chances of developing Alzheimer's disease. The study leaves a number of unanswered questions, including whether there will be any overall long-term benefit for patients given that the magnitude of effect is rapidly reduced with longer survival. Together with other research, the study underscores the need for further investigations into the long-term neurocognitive outcomes of cancer treatments. Additionally, from the Alzheimer's disease perspective, the study indicates the need for clinical trials to be initiated investigating the efficacy of low-dose radiotherapy in early disease.

ONCODAILY MEDICAL JOURNAL

Peer-reviewed
Open-access
Scientific journal

doi.org/10.69690/odmj
oncodailyjournal.com
ISSN: 3067-6444

Aerial view of Riga.
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The Apparent Cancer Paradox of LATVIA

By Andrei Mihai

Latvia consistently ranks among the European Union's most troubled countries when it comes to cancer. The country lags behind EU countries on many cancer risk factors and also has one of the biggest gender disparities on the continent, with men having particularly high incidence.

According to 2021 Eurostat data, the country has the third-highest overall cancer death rate in the bloc (283.5 deaths per 100,000 inhabitants), surpassed only by Hungary (309.9) and Croatia (308.2). And yet, according to data from The Lancet and Eurostat, Latvia reports some of the lowest death rates in the EU for several of the most lethal cancers, including colorectal, breast, and lung cancer. Is this a hidden success story, or something else entirely?

Latvia's Cancer Problem

No matter how you look at it, Latvia's cancer burden is stark compared to its European counterparts. OECD data from 2022 paints a slightly different picture than Eurostat, but also confirms Latvia as one of the countries with the highest cancer burdens on the continent. Latvian men, in particular, have much higher rates than the continental average.

Part of this problem comes from behavioral risk factors. Latvia has the dubious honor of having the highest level of alcohol consumption in the EU. This is particularly pronounced among men, with one in four reporting monthly binge-drinking episodes. Tobacco consumption is also a critical public health challenge. Despite a decline from a peak of 45.4% in 2000, the smoking rate in 2022 was still 33.9%, well above the EU average.

Physical inactivity further compounds these risks. Studies have consistently shown that a large portion of the Latvian population leads a sedentary lifestyle. In 2013, 71% of women and 66% of men reported that they never or seldom engage in physical activities. More recent data from 2018 indicates that a sufficient level of physical activity is observed in less than 6% of adults.

All these behavioral risks are what's driving Latvia's cancer incidence (and mortality) up. Environmental factors (like pollution) and genetics don't seem to be particularly impactful, though does not account for historical pollution, particularly from when Latvia was still a part of the USSR. Overall, Latvia has one of the highest rates of preventable mortality in the OECD and EU, and this also shows up in cancer statistics.

The high burden of risk factors in Latvia is further accentuated by an under-resourced healthcare system, which, despite pockets of success, still

struggles with key aspects of cancer control, particularly in prevention and early detection. The performance of Latvia's national cancer screening programs is a central and unifying driver of its poor overall cancer outcomes. Participation rates in colorectal screening programs, for instance, are just over 19%, compared to a EU target rate of over 45%. Several other cancer types also have chronically low participation rates, and the country's overall investment in cancer is also among the lowest in Europe.

Yet surprisingly, Latvia has the highest survival rate for lung cancer and pancreatic cancer, and one of the highest survival rates in ovarian cancer.

A Complex Relationship With Hidden Variables

Data from the CONCORD-3 study, published in The Lancet in 2018, put Latvia among the highest survival rates for several types of cancer.

The case of colorectal cancer (CRC) in Latvia presents one of the most intriguing examples. Across Eastern Europe, survival rates are low, yet Latvia's are among the highest. Furthermore, men, who in Latvia seem to have a disproportionately high burden, recorded the very lowest share of deaths from CRC in the entire EU.

Colorectal cancer screening in Latvia is primarily opportunistic. Screening is primarily offered through GPs as part of general prevention and is not a population-based program like cervical and breast cancer screening. While the state provides funding for screening tests for individuals aged 50-74, participation rates remain low.

This seems to hint at the existence of a powerful, population-level protective factor, and not a treatment effect. In the case of CRC, diet could be a part of the explanation. Latvian diet is uniquely characterized by high consumption of dark rye bread (rupjmaize) and fermented foods. A substantial body of scientific evidence supports the chemopreventive properties of whole-grain rye. It is exceptionally rich in dietary fiber, which increases fecal bulk, shortens intestinal transit time, and dilutes potential carcinogens. The fermentation of rye fiber by gut microbiota produces high levels of short-chain fatty acids (SCFAs), particularly butyrate, which has been shown to inhibit the growth of cancer cells.

Traditional Latvian meals include many fermented foods. Photo credits: Wiki Commons (CC BY 3.0).

Yet, as tempting as it is to attribute a victory to diet, this has not been investigated at the population level in Latvia and is speculative. Furthermore, diet does little to explain the other apparent paradoxes. The fact that Latvia also reports surprisingly high survival rates for pancreatic cancer, ovarian cancer, and lymphoma is even more perplexing. These are unrelated cancers, and everything from low spending to poor access to individual risk factors would lead to the contrary assumption. The case of lung cancer is even more striking, as Latvia has a long and well-documented history of high smoking prevalence.

All this seems to suggest the argument for a systemic reporting anomaly rather than a specific clinical success in lung cancer. Latvia's seemingly low death rates for certain cancers may be statistical masking, with many cancers (and especially aggressive cancers) simply escaping diagnosis. This also seems to be supported by the low confirmation rate of lung cancers. The potential misclassification of causes of death (particularly in lung cancer cases) contributes to underreported incidence and mortality, artificially ballooning survival rates.

Ultimately, the Latvian cancer paradox seems to be less a story of hidden success and more a cautionary tale about the limitations of data. The high survival figures for some of its deadliest cancers could be a statistical mirage, created by a healthcare system where many patients fall through the cracks.

Before any clear conclusions can be drawn, the fundamental challenge remains to build a system robust enough to accurately see the problem it needs to solve. Only with clear, reliable data can Latvia begin to truly address the heavy and preventable burden of cancer that continues to claim its citizens.