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CARYN LERMAN'S AACI PRESIDENTIAL INITIATIVE: CLOSE THE DIVERSITY GAP IN THE CANCER CENTERS' WORKFORCE

The Association of American Cancer Institutes is designing two programs to address systemic underrepresentation of racial and ethnic minority physicians and scientists in leadership positions in oncology.

→ PAGE 4

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Paul Goldberg

Associate Editor
Matthew Bin Han Ong

Reporter
Alexandria Carolan

Reporter
Alice Tracey

Director of Operations, Illustrator
Katie Goldberg

Marketing & Account Manager
Mona Mirmortazavi

Designer
Jacqueline Ong

IT Manager
David Koh

Editorial, Subscriptions and Customer Service
PO Box 9905 -
Washington, DC 20016

T 202-362-1809
F 202-379-1787
W www.cancerletter.com

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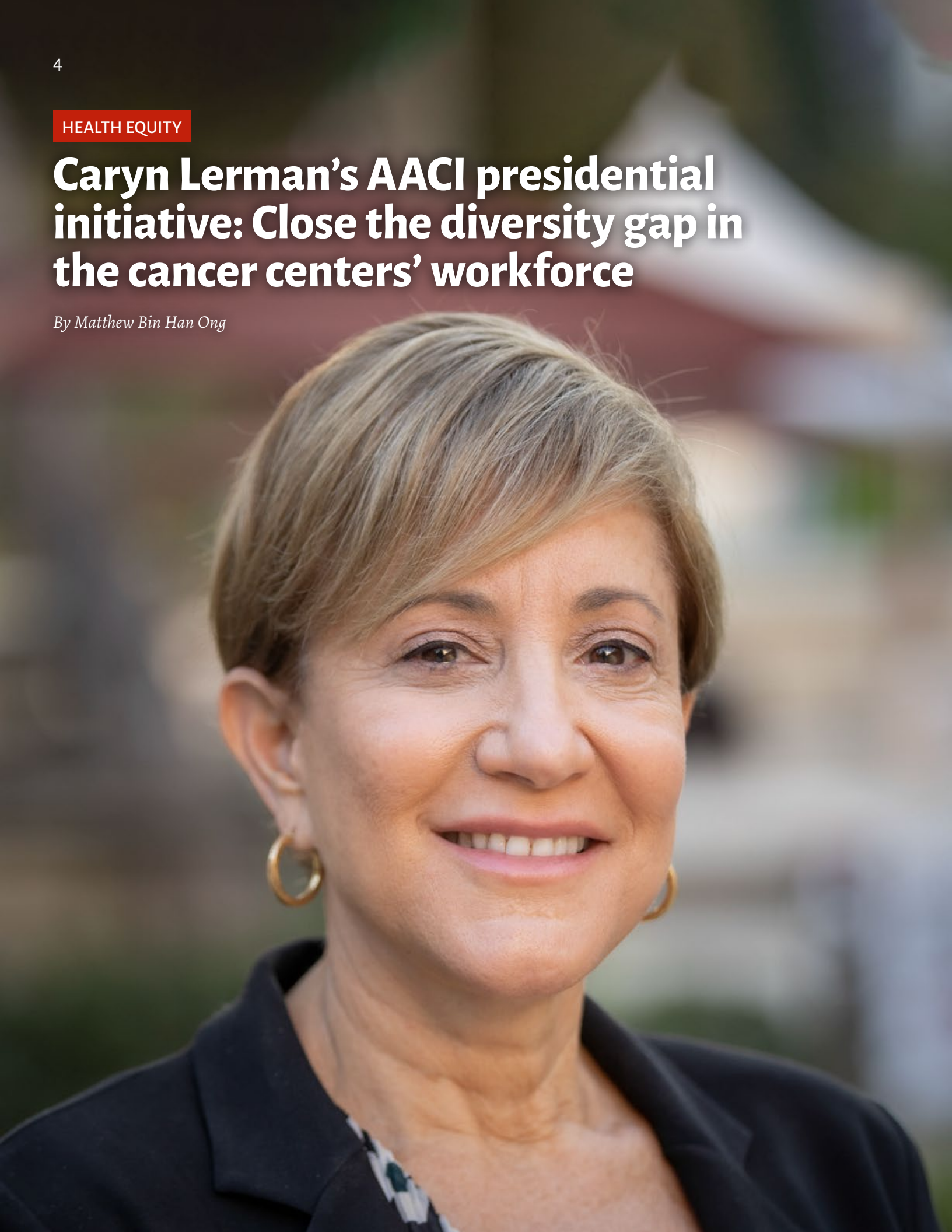
In this issue

HEALTH EQUITY

Caryn Lerman's AACI presidential initiative: Close the diversity gap in the cancer centers' workforce

By Matthew Bin Han Ong



The Association of American Cancer Institutes is designing two programs to address systemic underrepresentation of racial and ethnic minority physicians and scientists in leadership positions in oncology.

The two-year initiative is led by Caryn Lerman, AACI president and director of the USC Norris Comprehensive Cancer Center.

"The problem we are trying to solve with this initiative is the disconnect between the capacity and diversity of the current cancer center workforce and the needs of our increasingly complex cancer centers," Lerman said at the virtual AACI meeting Oct. 20.

The leadership development programs will also be fulfilling an unmet need—an overwhelming proportion of cancer centers, up to 7 in 10, don't offer formal leadership development programs, according to a recent AACI survey of 59 member cancer centers.

"Closing this gap requires many factors, including but not limited to building a diverse pipeline from both within and outside of the center, implementing deliberate and tailored leadership development to build the skills necessary to succeed in a complex cancer center environment, and ensuring that our centers provide comprehensive onboarding and mentoring for new and emerging cancer center leaders," Lerman said.

Lerman's initiative is the latest in a series of high-profile efforts in oncology to take meaningful steps toward increasing diversity in the workforce, improving access for minority patients, and reducing cancer disparities (*The Cancer Letter*, Health Equity, 2021).

The demographic results of the fall 2021 AACI survey mirror trends identified in a 2020 survey co nducted by *The Cancer Letter* in partnership with AACI, which found an urgent need for more diversity in leadership of North American academic cancer centers (*The Cancer Letter*, Oct. 9, 2020).

An independent study by Memorial Sloan Kettering Cancer Center researchers, who reached similar conclusions, found that racial and ethnic minorities that are underrepresented in medicine have even lower representation in leadership of NCI-designated cancer centers (*The Cancer Letter*, June 25, 2021).

The fall 2021 AACI survey, conducted by Lerman and her steering committee, found:

- The vast majority of cancer center directors (76.3%) and deputy directors (85.1%) are non-Hispanic white.
- Women make up only 14% of cancer center directors and 28% of deputy directors.
- About three quarters of cancer center associate directors (73.1%) and research program leaders (76.6%) are non-Hispanic white.
- There is greater gender parity among associate directors (44% women) and research program leaders (40% women).

"Considering our data, you see that even at the research program leader level in the cancer centers, the associate directors level, if we started there, we'd still be working with a talent pool that's not especially diverse, as shown by the AACI data. So, it's starting earlier," Lerman said. "I would say, starting early, mining the talent pool among your members, looking for people with motivation, emotional intelligence, and just that ambition. And so, start at the beginning.

"There's a lot of interest in these programs among faculty. The problem is then people go through this leadership development training, they get very excited, and then, because the current leaders—there's no succession plans, often, there's no term limits for certain roles—you have this excitement that you've generated, you don't have the open positions for people to move up the food chain, and then they end up leaving," Lerman said. "You have to actually create opportunities for leadership roles to move people into.

AACI, a professional organization for cancer center directors and leaders in North America, is the right vehicle for a leadership initiative like this, said Karen Knudsen, immediate past president of AACI and CEO of the American Cancer Society. Executive coaching and engagement can help young leaders get involved in each institution's Cancer Center Support Grant process to obtain or renew NCI designation.

"AACI always provides training on CCSG and what's new with NCI rules," Knudsen said at the virtual meeting. "So, hopefully that's a part of it. I see this as something for which the demand will only continue, not end in two years. This is certainly a developing business case for an incredible organization to take on what is a major gap in developing new leaders and do something about it."

NCI, too, is refocusing its programs to ensure that the institute is looking at its entire portfolio "through a lens of health equity."

"We all share responsibility to change this in whatever way we can and to bake health equity into sort of everything we do," NCI Director Ned Sharpless said during his Calabresi Memorial Lecture

at Yale Cancer Center Nov. 2. "Let's build a reality in which your location, or your race, or your education doesn't predict the outcome of your disease."

A recent analysis of NCI's workforce and grant recipients shows that Black and Hispanic scientists are dramatically underrepresented across key metrics, both intramural and extramural (*The Cancer Letter*, July 2, 2021).

"We've really redoubled our efforts to make headway against the problem of underrepresentation within the cancer research workforce," Sharpless said.

NCI has deployed two programs—CURE and FIRST—to improve representation in the oncology workforce. The institute has also doubled its budget for health disparities-related research and training since 2015.

"Socioeconomic status alone can't really capture what's going on here. We need more sophisticated approaches to understand this interaction between rurality and poverty, particularly through time. A key for cancer disparities is to stop single-variable analyses and start working on these populations in their totality, with all their complexity."

A story about Sharpless's Calabresi Lecture appears on page 13.

Lerman's vision will dovetail with Knudsen's ongoing 2020-2021 AACI presidential initiative to reduce cancer disparities across North America and collate best practices (*The Cancer Letter*, Oct. 16, 2020). To achieve that, Knudsen's initiative is:

1. Identifying cancer disparities in each center's catchment area,
2. Discovering currently implemented strategies for reducing disparities and opportunities for improvement, and
3. Delivering an action plan for broader advocacy across the oncology community.

To date, 102 AACI member cancer centers have been surveyed. Of that number, catchment area and disparities data from 89 institutions have been analyzed and mapped.

"We did it by ZIP code, by county, and that's how we overlapped the data as well with the population density, with incidence and with mortality. I credit our advisory group of leaders of AACI centers who helped us sort that through," Knudsen said."So, everything was funneled down to the county level.

"That's why I went back out to the centers to say, here's what we think you said using counties as a unit, so let us know if that's right. So, if a county was claimed more than once, that was the first heat map. And in fact, North Carolina turned out to be the poster child of the area where the counties had the most claims from multiple cancer centers."

Knudsen expects the initiative to generate a report that would "inventory" cancer disparities across the continent.

"I think we will find a lot of value in that," Knudsen said. "So, we're not just saying, 'In Philadelphia County, here's the issue,' but 'In 400 counties across the United States, here's an issue,' becomes a much more empowering message."

Lerman's two-year plan to create a diverse leadership pipeline would culminate in two deliverables: an AACI Leadership Development Workshop and an AACI Leadership Development Toolkit. Both programs are anticipated to include curriculums that would help new cancer center directors transition into their jobs and provide emerging leaders with the skills needed to navigate their careers.

> "We're not just saying, 'In Philadelphia County, here's the issue,' but 'In 400 counties across the United States, here's an issue,' becomes a much more empowering message."
>
> *– Karen Knudsen*

STEERING COMMITTEE

Caryn Lerman, PhD
USC Norris Comprehensive Cancer Center

David M. Gosky
The Ohio State University Comprehensive Cancer Center – James Cancer Hospital and Solove Research Institute

Chanita Hughes Halbert, PhD
USC Norris Comprehensive Cancer Center

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The University of Kansas Cancer Center

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Salk Institute Cancer Center

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Holden Comprehensive Cancer Center, University of Iowa

Cheryl L. Willman, MD
Mayo Clinic Cancer Center

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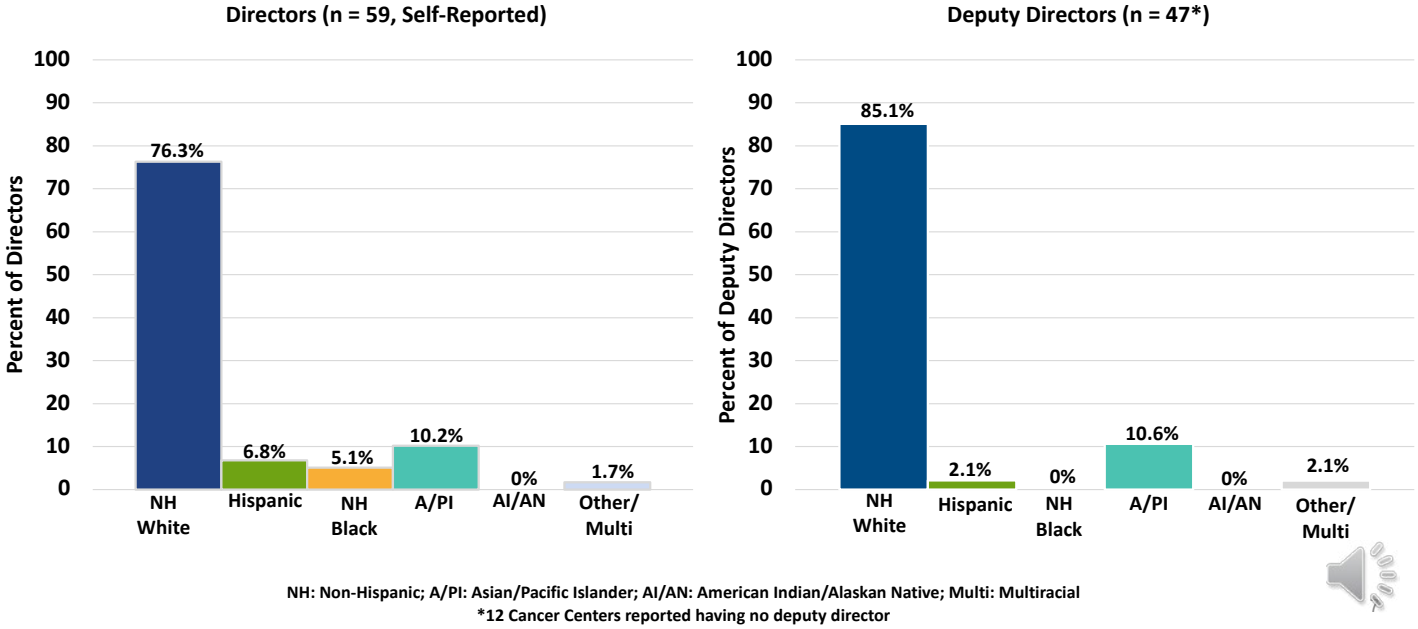
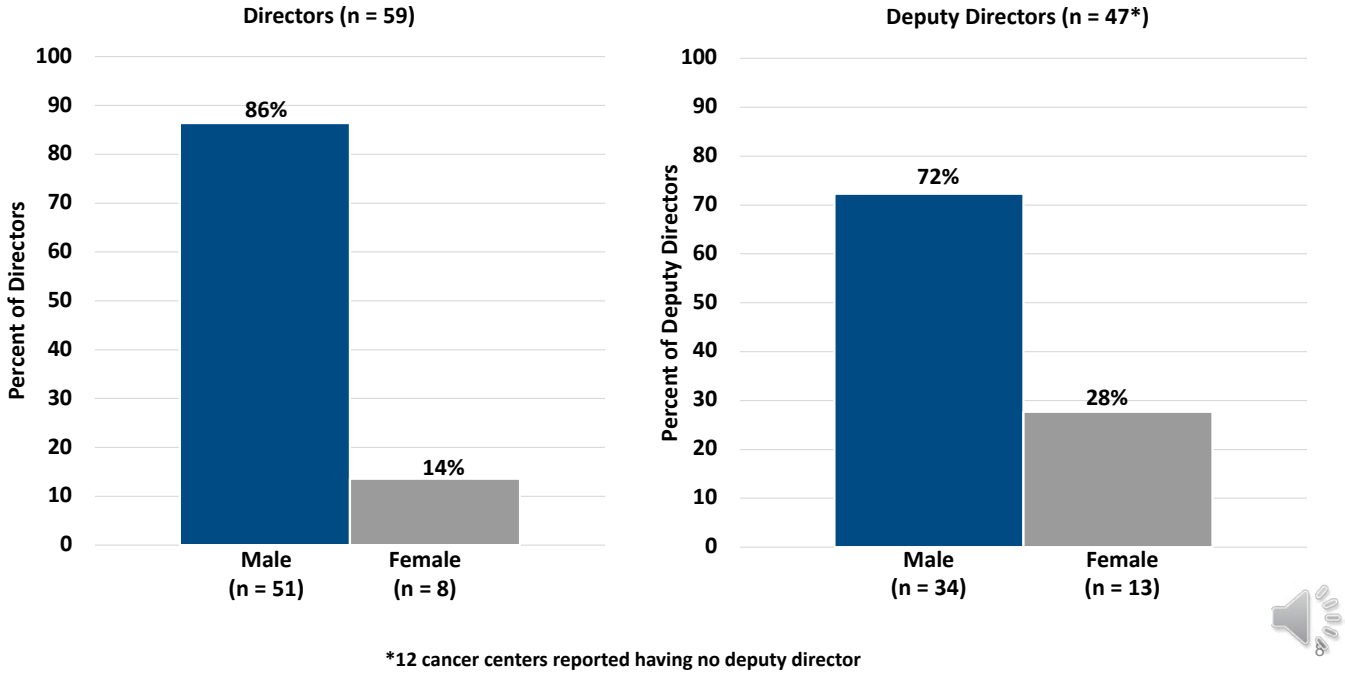
RACE/ETHNICITY OF CANCER CENTER LEADERSHIP



NH: Non-Hispanic; A/PI: Asian/Pacific Islander; AI/AN: American Indian/Alaskan Native; Multi: Multiracial
*12 Cancer Centers reported having no deputy director

2021 AACI/CCAF Annual Meeting

GENDER OF CANCER CENTER LEADERSHIP



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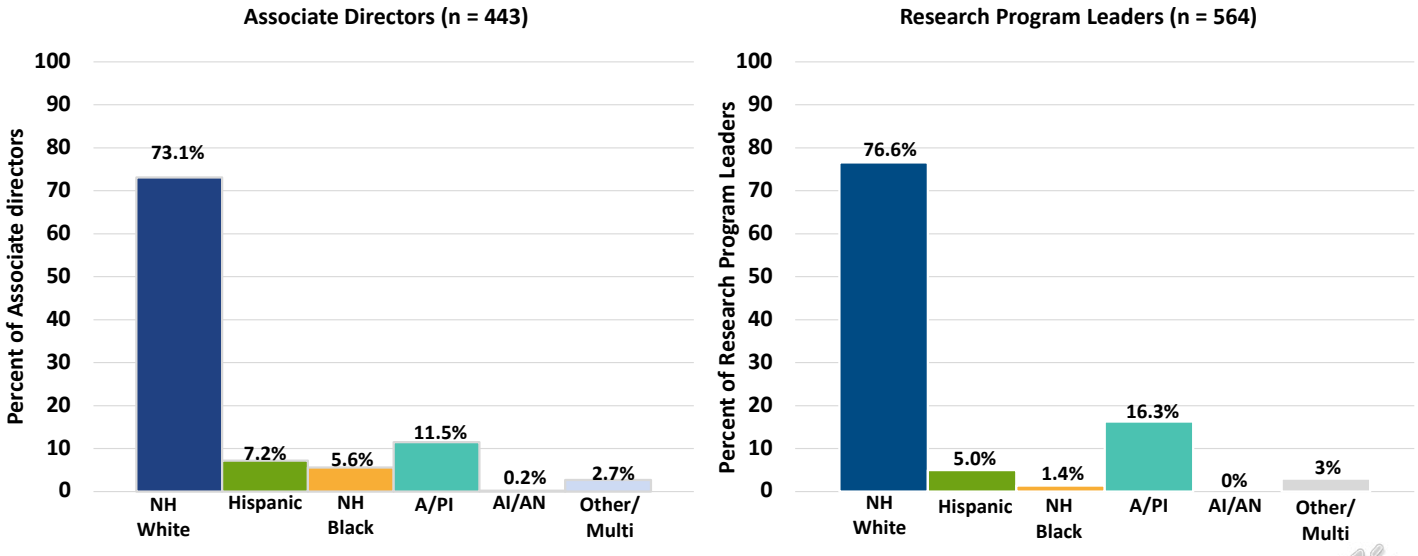
RACE/ETHNICITY OF CANCER CENTER LEADERSHIP



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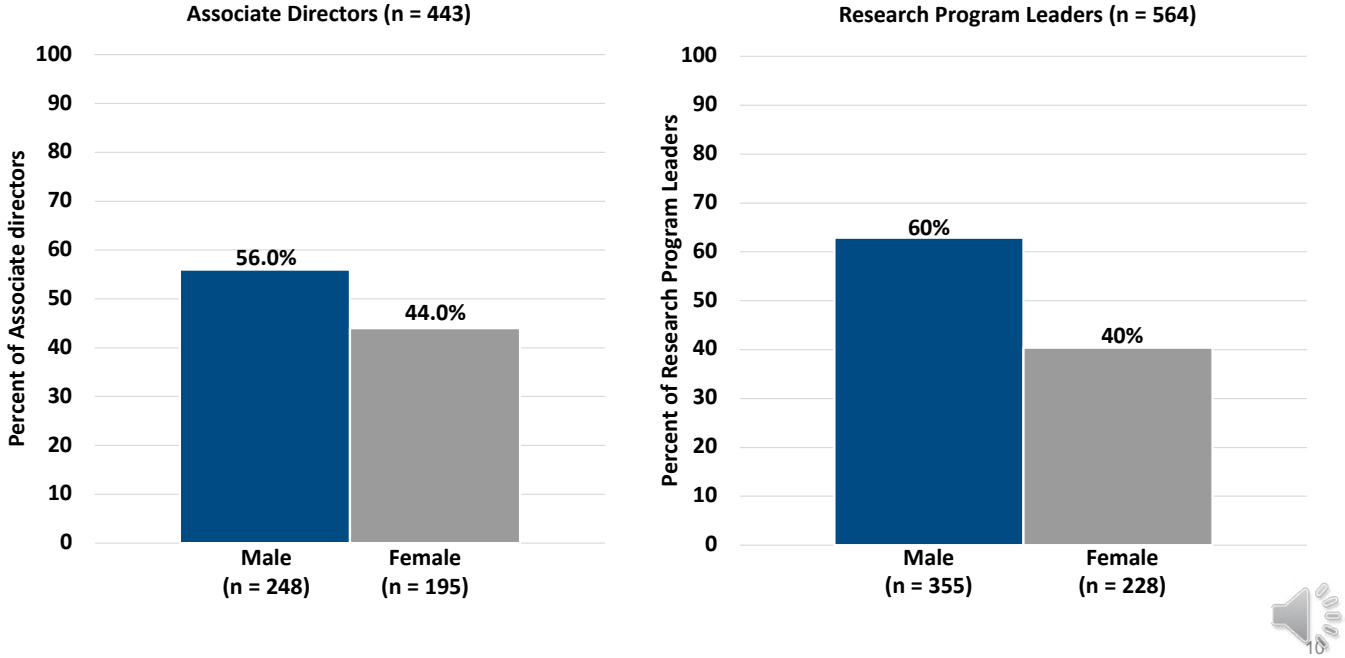
GENDER OF CANCER CENTER LEADERSHIP



"There was almost universal interest in participating in a program if offered by the AACI," Lerman said at the meeting. "Components of such a program deemed by our centers to be most important include communication and collaboration, followed by skills development and career counseling to become a cancer center leader, as well as resiliency and negotiation skills.

"After badgering those centers who didn't respond to the survey, we'll more fully analyze the data and prepare a publication that also includes best practices for building, onboarding, and developing a diverse pipeline of cancer center leaders."

Lerman's and Knudsen's presidential initiatives would, as one might say, kill two birds with one stone—creating a pipeline of diverse leaders with the skills and cultural competency to design targeted programs, based on the collected data, to effectively reduce cancer disparities at a hyperlocal scale.

"Through our collaboration on these AACI presidential initiatives, we aim to empower a diverse group of emerging leaders to take action to address the cancer disparities within the multicultural catchment areas they serve,' Lerman said to *The Cancer Letter.*

Lerman's remarks at the virtual AACI annual meeting follow:

Welcome. I'm Caryn Lerman, AACI president since July 2021, and director of the University of Southern California Norris Comprehensive Cancer Center. I'm delighted to share this presidential initiative with you today and look forward to your feedback.

The problem we're trying to solve with this initiative is the disconnect between the capacity and diversity of the current cancer center workforce and the needs of our increasingly complex cancer centers.

The practice of oncology is evolving rapidly with new informatics technologies and precision therapies, while shifting reimbursement policies are affecting our cancer service line margins. Leadership skills are generally not taught during traditional clinical or biomedical training. And today's leaders were often selected based on their excellence as clinicians, researchers, or educators.

Moreover, there's a disconnect between our nation's diversity and the diversity of the cancer center leadership workforce.

Closing this gap requires many factors, including but not limited to building a diverse pipeline from both within and outside of the center, implementing deliberate and tailored leadership development to build the skills necessary to succeed in a complex cancer center environ-

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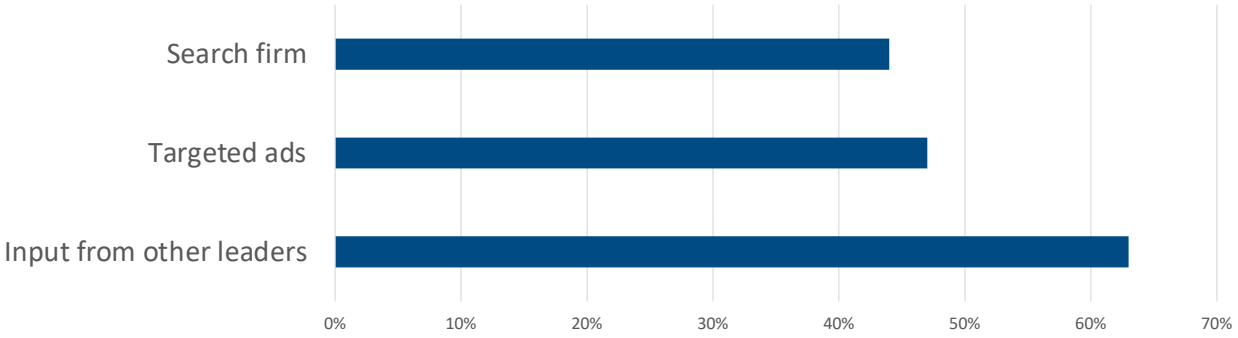
BUILDING A DIVERSE PIPELINE: SEARCH PRACTICES

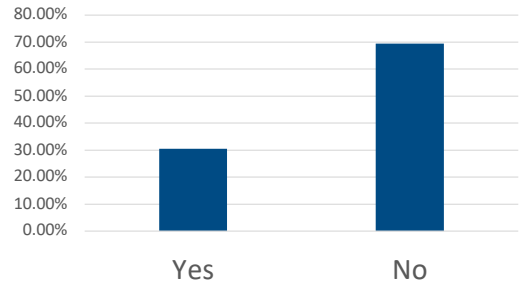
- >25% of respondents typically make appointments for cancer center senior leaders without searches or use internal search processes

Strategies found most effective to create a diverse pool for senior leader searches (not mutually exclusive) include:

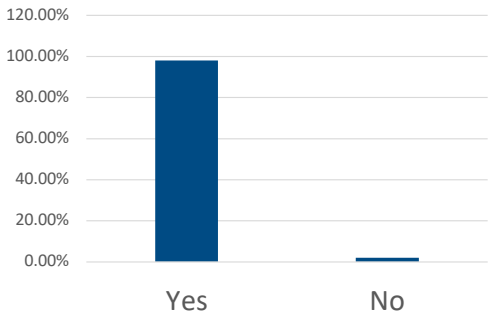


LEADERSHIP DEVELOPMENT

Does your cancer center offer a formal leadership development program?



Would you or your cancer center members likely participate in a program if offered by AACI?



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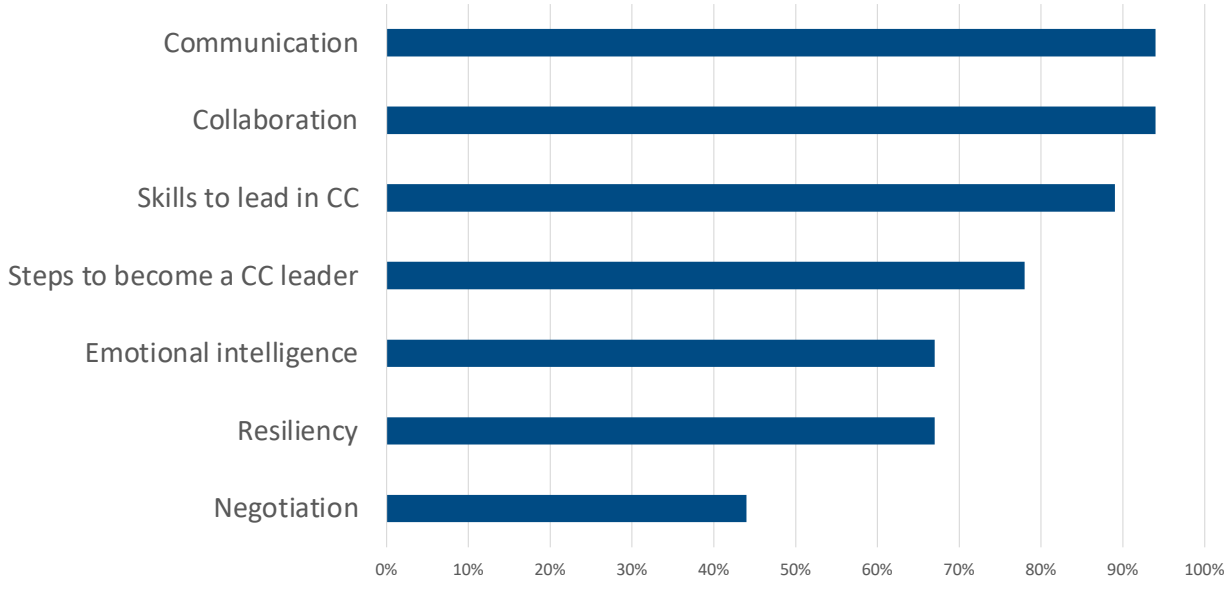
LEADERSHIP DEVELOPMENT: PERCEIVED NEEDS



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2021 AACI/CCAF Annual Meeting

ACTION PLAN

YEAR 1

- Publication with survey data and best practices for building, onboarding, and developing a diverse pipeline of cancer center leaders

- Develop curriculum to foster the onboarding of new cancer center directors:
  - Business acumen; cancer service lines and funds flow models; working with deans/CEOs, etc.
  - Peer mentorship program
  - Primer on cancer centers for institutional leaders

- Develop a rotating career development curriculum for emerging leaders:
  - Communication, collaboration, negotiation, etc.

YEAR 2

- Launch AACI Leadership Development Workshop with breakouts based on role
- Create AACI Leadership Development Toolkit for adaptation at AACI Centers
- Evaluate impact

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> Considering our data, you see that even at the research program leader level in the cancer centers, the associate directors level, if we started there, we'd still be working with a talent pool that's not especially diverse as shown by the AACI data.
>
> – *Caryn Lerman*

ment, and ensuring that our centers provide comprehensive onboarding and mentoring for new and emerging cancer center leaders.

To examine the potential for a presidential initiative in this area, and to define the scope and desired outcomes, I'm fortunate to collaborate with an exceptional team of center directors, associate directors and leaders in diversity, equity, and inclusion who formed this steering committee. This presentation is a product of our collaboration.

To establish a baseline for our initiative, we launched a survey that 59 of the AACI cancer centers have completed to date. For those of you who have not completed the survey, we will be sending another notice after the annual meeting. Those centers participating will be listed in the appendix of a publication to be developed from these data.

Our first goal was to characterize the race, ethnicity and gender of cancer center senior leaders at our centers to establish a baseline. As shown here, of the 59 respondents, the vast majority of our cancer center directors and deputy directors are non-Hispanic, white, and it's not a big surprise, but they're also predominantly male cancer center directors and deputy directors.

We also see this at the level of associate directors and research program leaders, suggesting that our pipeline of future leaders also lacks diversity. We start to get a bit closer for the gender of associate directors and research program leaders, though there are still opportunities for greater balance.

Assessing practices for building a diverse pipeline, our survey also shows that most centers use a combination of internal and external search practices, though making appointments without an internal-external search is still a fairly common practice, and one that can lead to appointments of the so-called usual suspects.

Strategies found to be most helpful in creating a diverse pool for senior leadership recruitments include the use of search firms, targeted placement of advertisements, and input from other leaders.

The majority of centers responding to the survey do not offer leadership development training programs at their centers, but there was almost universal interest in participating in a program if offered by the AACI.

Components of such a program deemed by our centers to be most important include communication and collaboration, followed by skills development and career counseling to become a cancer center leader, as well as resiliency and negotiation skills. Based in part on these data, our steering committees developed a set of deliverables and a rough timeline shown here.

After badgering those centers who didn't respond to the survey, we'll more fully analyze the data and prepare a publication that also includes best practices for building, onboarding, and developing a diverse pipeline of cancer center leaders.

This will lay the foundation for the development of curriculum to foster the onboarding of new cancer center directors and administrators, including such topics as cancer service lines, fund flow models, business acumen and others, and as well as a peer mentoring program. We will also develop a rotating career development curriculum for emerging leaders, emphasizing key skills for future development.

This will culminate in the first AACI leadership development workshop at the 2022 meeting with emphasis on underrepresented groups, followed by the creation of a toolkit for those centers that are interested in adapting the program and offering the program at their own institutions.

I look forward to your questions and feedback.

This story is part of a reporting fellowship on health care performance sponsored by the Association of Health Care Journalists and supported by The Commonwealth Fund.

NCI DIRECTOR'S REPORT

Sharpless: It's time to confront the current reality of cancer and unravel it

By Alice Tracey

The National Cancer Act of 1971 established an unprecedented government-wide plan to eradicate a major disease, creating institutions that have no equivalent in other therapeutic areas and galvanizing the nationwide conversation about cancer.

Alas, 50 years ago, the framers of this landmark law were in no position to foresee the challenges ahead. A lot of scientific discoveries had yet to be made, NCI director Ned Sharpless said during his Calabresi Memorial Lecture at Yale Cancer Center Nov. 2.

"As visionary as the National Cancer Act was, it was also naïve," Sharpless said in a talk titled "Working Together to End Cancer as We Know It: 50 Years of the National Cancer Act."

"The optimism induced by the legal mandate and strong infrastructure was soon tempered by the realization that this objective was going to be so challenging," Sharpless said.

Those present at the start of the National Cancer Act thought there would be a cure in five to 10 years, he said. The likes of Sidney Farber thought a cure could be achieved by 1976.

Eradicating all cancer is no longer the goal, Sharpless said. "Based on what we know about human biology today, we don't believe that's possible at the NCI, at least any time soon," he said. "But, we do think we can dramatically change the experience of cancer—that is, the tragedy of cancer, the way the American public knows cancer today."

Since Cancer Moonshot was launched in 2016, President Biden has been pushing for research breakthroughs to "end cancer as we know it" (*The Cancer Letter*, April 6, 2021). Sharpless said NCI has been thinking about what it means to "know" cancer, particularly in light of the 50th anniversary of the National Cancer Act.

Part of this reflection has been clearly defining what an end to cancer would look like.

"Patients, I think we should be clear, still want to be cured of their disease. And if that's not possible, they want their cancer to be turned into a manageable chronic disease so they'll have more quality time with their loved ones," Sharpless said. "So, that's really what we're talking about when we say ending cancer as we know it, or knowing cancer today, and that's what the president wants us to do."

What NCI is doing about health disparities

Population sciences, public health measures, and refining of metrics figure in the National Cancer Act. Today, these measures guide NCI's pursuit of health equity.

"I would argue that we need to look at all our work through a lens of health equity, we need to ask to what extent might this study reinforce existing ineq-

uities, or might reflect hidden biases," Sharpless said.

"Let's build a reality in which your location, or your race, or your education doesn't predict the outcome of your disease. And let's take what we've learned and create tests that identify cancer at its earliest stages. And let's ensure that once these cancers are detected, each cancer can be treated and treated effectively.

"Socioeconomic status alone can't really capture what's going on here. We need more sophisticated approaches to understand this interaction between rurality and poverty, particularly through time," Sharpless said. "A key for cancer disparities is to stop single-variable analyses and start working on these populations in their totality, with all their complexity."

The next steps for NCI are "to advance health equity, to personalize cancer care, to embrace new technologies and innovations, to inspire the next generation of cancer researchers, and to prepare for the challenges of the future."

To improve representation in the oncology workforce, the NCI has established two programs, CURE (Continuing Umbrella of Research Experiences)—which offers opportunities to promising young researchers—and First (Faculty Institutional Recruitment for Sustainable Transformation)—which aims to diversify faculty in biomedical research.

"You see, the NCI invested in the cohort approach with FIRST, and the pipeline approach through CURE, and we are really trying to consider whatever approach might work best in terms of developing faculty diversity."

Looking toward the future

"Having discussed some of the challenges we face, cancer as we know it today, the reality is that we will still need more progress for early detection, disparities, and advances in rare and difficult to treat cancers," Sharpless said.

"What are we working toward? If we're building a bridge to the future of cancer, what's on the other side of that bridge? A world where these statements are no longer true, where we will have changed cancer as we know it. And I think that future is within our reach. Let's focus on a future where all people with cancer have the support and resources needed to navigate their care."

Sharpless said the National Cancer Act marked a "modern era of cancer research" that is still unfolding.

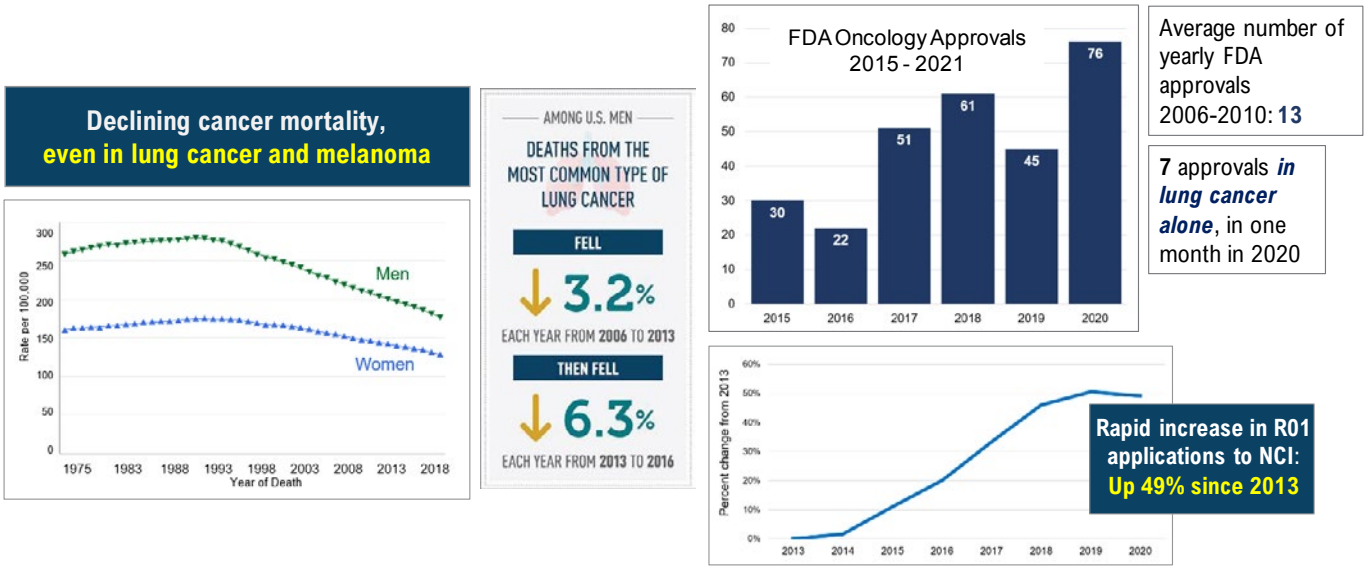
"The years ahead will be sharper and focused, different in tone, and more practical, more cognizant of the size and timelines of these challenges, and more based on the foundational molecular biology and biological understanding of cancer," Sharpless said.

Sharpless addressed several areas the cancer community should focus on to "confront the current reality of cancer and unravel it," including:

- Rigorously testing screening modalities and updating screening guidelines
- Developing multi-cancer early detection tests (MCEDs)—potentially through ARPA-H, an NCI partner organization proposed by President Biden to advance groundbreaking cancer research
- Supporting research into the complex factors leading to disparities in cancer incidence and outcomes along racial, gender, and geographical lines
- Diversifying the oncology workforce to better reflect the populations it serves
- Designing clinical trials geared toward rare cancers that often aren't amenable to traditional trial structures
- Tackling childhood cancer by aggregating data through the NCI's Childhood Cancer Data Initiative

A video of the full lecture can be found here.

Remarkable progress in cancer research



The transcript of Sharpless's Calabresi Memorial Lecture follows:

Sharpless: Thank you for that kind introduction. It's good to see old friends, at least virtually. I wish I could be there in person. I love New Haven and we will have to take a rain check on this.

I'm really excited today to do this for two reasons—one, it's an opportunity to talk about the National Cancer Act and how important that's been on its 50th anniversary. But also, I think it's an opportunity to recognize a real giant among cancer researchers and cancer caregivers and such an important leader in our field.

As has been said, the Calabresi family has a deep connection to Yale, including Paul's father—who was a cardiologist, I'm told—and his mom had a degree from Yale, and we've heard about Judge Calabresi and his eminent work with Yale. And we hear about the next generation of Calabresis having these deep Yale connections.

Paul Calabresi also had a deep connection to the National Cancer Institute. I think his career actually began doing field work for the NCI, then he served the NCI in several capacities—including as chairman of some of our most important advisory boards, the National Cancer Advisory Board and the President's Cancer Panel, as Vince alluded.

And the honorable Guido Calabresi, I'm told, is here today. Let me offer a heartfelt recognition to all the Calabresi family for what they've contributed to Yale, improving what I believe is the human condition through their work.

I'm also pleased that Dr. DeVita is here. Vince is a giant in our field and has a direct connection to what we're talking about today, the National Cancer Act. Vince joined the NCI in 1963 and was NCI director from '80 to '88. Dr. DeVita has been a wealth of good advice to me in this role. I found his book, titled *The Death of Cancer*, a really interesting thing to read before I started as NCI director. I recall having a very interesting conversation with Vince about the FDA prior to me going to the FDA to be acting commissioner for seven months.

It was really informative to have that perspective in the back of my head as I worked regulating food and drugs. So, I think it's a fitting memory that we're going to talk about the National Cancer Act today, given Dr. Calabresi's connections to it. His contributions to cancer research, cancer care, and the

infrastructure, so to speak, of our research capabilities made him a real giant in our field.

I'm talking about his work in understanding the pharmacology of cancer chemotherapy, his work in combining chemotherapy with other modalities, his leading-edge research in geriatric medicine—which I think is very prescient for a cancer researcher—his devotion to patient care, which has really empowered his research activities, and his leadership on countless boards, committees, institutes, academies, societies, and various other governing bodies.

But I think perhaps most important is his invaluable membership to a real generation of leaders in cancer research and cancer care, including one of my old bosses, Dr. Bruce Chabner at the MGH. At the NCI, we honor Dr. Calabresi's contributions with a specific grant in his honor. It's the Paul Calabresi Career Development Award for Clinical Oncology.

These are K12 grants that are really designed to prepare oncologists for effective scientific careers, in particular by pairing them with basic scientists. I was actually the PI of the University of North Carolina's Calabresi award many years ago, and I know how important an award that is. It's fitting to honor Dr. Calabresi with a training award, for that stage of someone's career, given his terrific legacy of mentorship and training.

So, today I would like to talk about the National Cancer Act and how that changed from the period of Dr. Calabresi's career to modern day. I think the efforts of Paul along with other luminaries of the past five decades really drove and made possible the tremendous progress we're seeing today in cancer care and cancer outcomes. Their work provided this progress in the past, but also made possible these opportunities that I believe lie before us, and that will shape the future of cancer research and cancer care.

I think it's hard to overstate the importance of the National Cancer Act in 1971. For those of you who are younger and don't know a lot about the NCA, it did not create the NCI. The National Cancer Institute dates back to the 1930's.

But I would argue that in many ways, the National Cancer Act created the modern NCI. The thing that we recognize today as the National Cancer Institute united patients, doctors, scientists, industry, and government in a common vision.

Impact of the National Cancer Act

From my perspective, I think the NCA really did three important kinds of things. So, first off, we heard from Vince about how it provided additional funding for cancer research. I'm sure that that extra funding was very important to Dr. Carl Baker, who was director of the NCI at the time. I think more support for cancer is always important, but I would actually argue that the funding was probably the least important of the many important things the NCA did.

A second type of activity the National Cancer Act did was it gave the NCI a bunch of new authorities and created new critical infrastructure that led to some of the modern capabilities of the National Cancer Institute.

It encouraged the NCI to create a national database of cancer statistics, which led to the SEER program, arguably the most important set of cancer statistics in the world. It created Frederick National Lab, which is a way of doing research the NCI uses. It really invigorated and provided the framework for the modern cancer center program that we've heard about. It made the NCI director presidential appointee.

It did a bunch of other things like the President's Cancer Panel and the National Cancer Advisory Board, things that were really important. I think those authorities and new infrastructure were a really important part of the NCA, but maybe the second most important thing it did.

The third thing that I believe the National Cancer Act did, and arguably the most important thing the National Cancer Act did, was it made cancer something that we could talk about as a society. It turned cancer from a disease that had stigma associated with it, a diagnosis that was sort of hidden in the shadows, and it brought it out into the light. It really spurred the modern interest we have in cancer, the ability to talk about cancer, the ability to work on cancer, and the modern cancer advocacy movement, which has been so important. So, it was a really important act and it did things of terrific significance.

But, as visionary as the National Cancer Act was, it was also naïve. Many of the individuals involved at that time thought we'd have a cure for cancer very quickly, in five to 10 years. I think this was motivated by the experience of antibiotics and sepsis in the early 20th century.

Obviously, things didn't work out that way—cancer turned out to be a much more difficult problem than we understood in 1971. But, we have worked for five decades to better develop that basic science

understanding of cancer, and today we have a much better understanding of the molecular underpinnings of cancer and that better understanding is paying huge dividends for patients.

There are lots of ways to look at the remarkable progress in cancer over the last few decades. Some of the various takes on that are shown here. I believe that we'll look back on this period today as a golden age of cancer research, where we really began to take the basic science understanding of cancer and apply it to human benefit in a very direct way.

We'll think about this era today the way we think about antibiotics and the early 20th century for infectious diseases. It doesn't always feel that way, I know—I realize that the burden of cancer in American society is still very significant—but from my perspective, the progress in cancer is really remarkable.

Here are a few lines of evidence. First, on the far left here, we see this decline in cancer mortality. This started in the early 1990s. Cancer mortality peaked in the United States and has declined for both men and women since then, for lots of reasons—better cancer screening, tobacco control—lots of things have conspired together to lower cancer mortality rates in the United States. In recent years, this has picked up markedly. I think in recent years, some of those massive declines in cancer mortality are related to better therapy.

For example, I show statistics here for lung cancer, where a bunch of new therapies—kinase inhibitors, immune checkpoint inhibitors, better radiation and surgery, et cetera—have all led to a remarkable decline in cancer mortality on the order of 6%, from 2013 to 2016 per year. So, a fairly sharp decline in the most lethal cancer in humans.

This has been matched by a remarkable increase in FDA approvals of drugs and devices and other medicines for cancer patients—a remarkable period of productivity. I remember when I started as a fellow in this business, you could go a whole decade and not really have amazing new drugs approved in cancer care. Now it's a monthly event at the FDA. There was a period in 2020 where I think we had seven lung cancer drugs approved in the same month—really paradigm-changing new therapies.

I think there's real scientific excitement in cancer research. And that's shown down at the bottom right here; that's the graph of applications for National Cancers Institute funding. We can see this massive increase since 2013, a nearly 50% increase over about a seven year period in applications for funding from the NCI.

This is a mark that people have great new ideas for cancer therapy and are coming to our field with new proposals and new ways of treating cancer. That includes physicists and mathematicians and other kinds of biologists working with new clinical approaches, all seeking support from the National Cancer Institute for their research.

This also creates a problem—albeit, I would argue, a good problem—which is tremendous competition for funding for the NCI. Vince mentioned the 50% success rates for grant funding back in his era—it was as low as 8% earlier in my career at NCI.

We have now, through fairly Herculean measures, gotten it up to

> A key for cancer disparities is to stop single-variable analyses and start working on these populations in their totality, with all their complexity.

We lack effective early detection approaches to diagnose many types of cancer.

We leave too many patients and families to navigate the disease on their own.

We have curative therapies that come at the cost of serious side effects.

Cancer as we know it today

We have too few methods to prevent cancer.

We have stark inequities in diagnosis, treatment and trial access, and patient outcomes, based on race, region and resources.

Cancer kills 600,000 people per year in the United States, including close to 1,800 aged 19 and under.

We have limited success in some of the toughest to treat and rare cancers.

11%, but that is still a very low success rate for grants at the NCI, and something we're deeply concerned about, because that is the pool of grants where paradigm-changing ideas come from, the things that really move the field for patients. So, improving support for investigator-initiated science remains a top priority for the NCI.

I think many Americans have heard of these advances and really take them for granted. It's like computing power, automobile mileage; we just sort of expect these things to get better indefinitely without realizing all the work that went into them. But, that was not the case in 1971, that wasn't even the case in the early 1990's, it's really become a feature more recently. That is really built on the molecular understanding of cancer biology that we've developed in the past 50 years.

And now, I think we should talk about where we go from here, how we use this progress of the last five decades as a bridge to the future. This next period of bridge building will build on that momentum that we've established over the last 50 years. It's not just the momentum of the fundamental understanding of cancer and this knowledge base, but the keen scientific insights of those on whose shoulders we stand now, people like Dr. Calabresi and Dr. DeVita.

Cancer Moonshot

For the next few minutes, I'd like to talk about how we're going to build that bridge to the future, building on this progress. What motivated my talk's title today is a quote that's been made frequently by the president. President Biden has said many times now that he'd like to end cancer as we know it. And I think Paul Calabresi would be gratified to know that we have this president in the White House with an intimate connection to cancer research, who knows what our work means for the American public.

President Biden and the first lady have a very strong personal connection to cancer. The story of their son's death to glioblastoma is well-known to all of us. They're also firm believers in the power of cancer research. The tragedy that befell the Biden family led to then Vice President Biden's leadership of the Cancer Moonshot six years ago. The current administration, as I said, is calling for all of us as a community to end cancer as we know it.

We think that this problem is much bigger than just the NCI. The NCI is obviously a part of this, but this would require all the powers of the

federal government, as well as advocacy and caregivers outside of the federal government. In considering the achievements of the past 50 years and how to steer the future of cancer research, we've been thinking this through at the NCI. What does it really mean to end cancer as we know it? How do we know cancer today? What would it mean to change that experience of cancer? What would that take?

Redefining the end of cancer

First, let me be clear. There is no mention of eradicating all cancer. Based on what we know about human biology today, we don't believe that's possible at the NCI, at least any time soon. But, we do think we can dramatically change the experience of cancer—that is, the tragedy of cancer, the way the American public knows cancer today.

To get at this, we have to be upfront about the uncomfortable realities about cancer as we know it today. I mentioned a lot of the progress, and that progress is very exciting and has been very good, but we still have a long way to go.

In the United States, 600,000 Americans still die from cancer each year, cancer is still the leading cause of death for children from disease, and cancer costs the nation hundreds of billions of dollars every year in terms of treatment and lost productivity. Even when we're able to cure patients with cancer, too often this comes at the cost of severe treatments with significant long-term toxicities. Cancer for many patients is still a very devastating and life-changing diagnosis.

For people with a new diagnosis of cancer, telling them about all this great progress the last few years, that's really small comfort. They don't really want to hear from the NCI director about the record number of grant applications or FDA approvals or new infrastructure. They like to see cures or at least better treatments for their cancer, which provides them more time.

I once treated a woman in her early forties for metastatic triple negative breast cancer. We tried the usual therapies and it wasn't working. It wasn't going well. We were discussing what therapy to try next for her. And I did what we train our junior oncologists to do—I asked her what her goals were for therapy. I said, what do you want to get out of this next round of treatment?

As I said, this is something we inculcate in our medical students, and we sort of beat this habit into the residents and fellows to ask the patient what they want from therapy. It's an important thing to do, but in some ways it's also kind of a dumb question, right? It's no mystery what our patients want.

They generally want better treatments for their cancer. They want a cure for their cancer. They want their cancer to go away and never come back. So, the goals for therapy are usually pretty obvious. What we're really doing in this period is trying to get them to understand what's possible—managing expectations based on what we believe we can deliver.

This patient told me that she knew she would die of cancer. She knew she had untreatable, refractory metastatic disease, and she had no illusions of being cured, but she wanted more time. She had three children who were middle school aged at the time, and her goal of hers was to see them graduate from high school.

That's all she wanted, just a few more years. It didn't seem at the time like an unreasonable request, given all this progress and work we've had in cancer, but we couldn't even do that for her. She died about a year later.

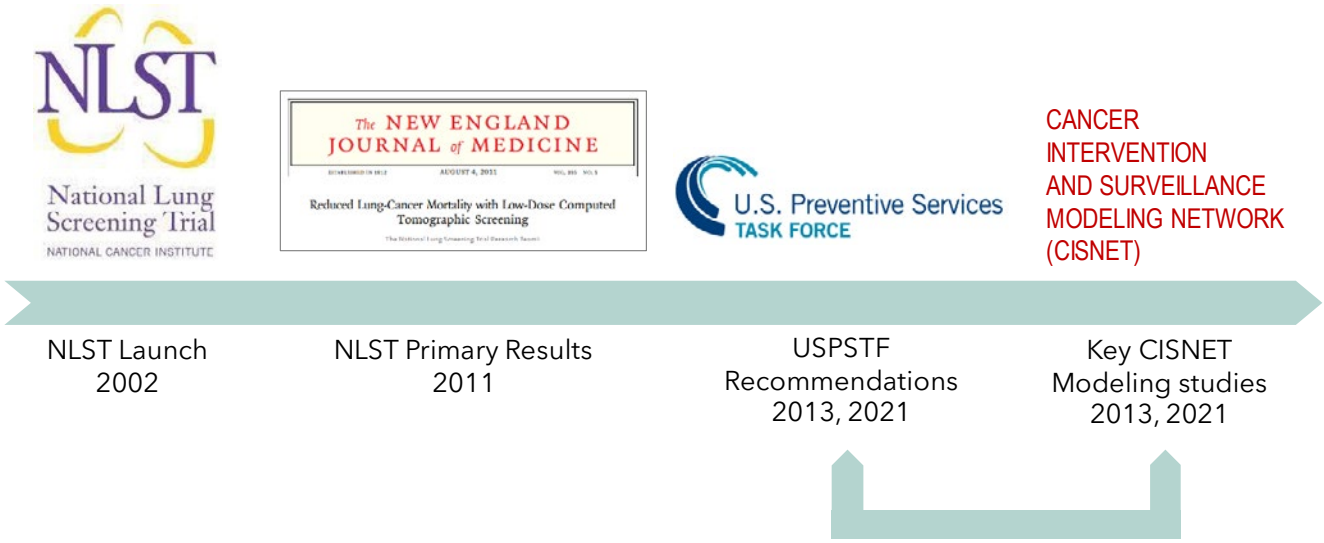
I've argued many times before that many of us in the cancer community have become afraid about talking about curing cancer. I believe I made this exact point at Yale in 2017, soon after I became NCI director. I know why using the word 'cure' around patients causes so many problems for caregivers.

I understand the worry about providing false hope and empty promises. I know that we have gotten into this habit of qualifying our language all day long, of caveats and disclaimers and talking about things like disease-free survival and remission and whatever metric's in vogue that day.

But patients, I think we should be clear, still want to be cured of their disease. And if that's not possible, they want their cancer to be turned into a manageable chronic disease so they'll have more quality time with their loved ones. So, that's really what we're talking about when we say ending cancer as we know it, or knowing cancer today, and that's what the president wants us to do. At the National Cancer Institute, we've been thinking a lot about what it means to know cancer.

One way to think about this is things that are true about cancer today—true statements that we would like to make untrue in some way. If we can make these things untrue, then

Lung cancer screening



in doing so, we would change cancer as we know it. So, I've spoken at length already about cancer mortality, in this box here in the lower left.

I gave a lecture last April at AACR when I described how I believe a strong reduction in cancer mortality is possible, building on momentum we've seen over the last 30 years. I talked about the things that we could do to try and cut cancer age-adjusted mortality in half, from its peak in 1990 to half of that in the next few years, and some approaches that one could take to try and get there as quickly as possible.

So, those are things that would really drive down age-adjusted mortality quickly. You can say this is really the ultimate measure of our progress in cancer, how many people are dying of cancer. But there is a lot more to the experience of cancer than just mortality.

Today I wanted to focus on some of the other topics that we talk less about. A few are shown here. For example, we have too few ways to prevent cancer. Many treatments are so toxic that they are intolerable and cause lifelong morbidity. Too many patients are stymied by the complicated logistics of cancer care, creating these disparities because of access to care. I know we can all think of other statements that are true about cancer and things that we'd like to make untrue about cancer.

I believe it's within our power to deliver on the president's call to action, to confront the current reality of cancer and unravel it, to take today's sad reality, and realize a better future. In the months ahead, I want all of us in the cancer community to consider the steps we can take to solve these problems as we've solved many other related problems for the past five decades.

I don't really have time today to delve into all of these, so I thought I'd pick a few to talk about. The ones that I boxed here are the areas where I'd like to focus. We've already talked about mortality a bit, so I thought I'd take on early detection and screening, health inequities, and refractory and rare cancers.

Screening and detection

In 1971, cancer screening and detection was really in its infancy, but we now know that screening and early detection are really powerful tools for cancer outcomes in individuals, but also at the population level. It's clear that development of effective screening approaches has been transformative, but we think things are really early in this field still, and believe screening and detection could be even more impactful than they are today.

Blood-based multi-cancer early detection tests (MCEDs)

Promising potential & need for rigorous evaluation

Can MCED tests detect many subclinical cancers at early stage **and reduce mortality?**

How safe is an MCED-negative test result?

What are the rates of false-positive/negative results, and of finding indolent cancers (overdiagnosis)?

Now we have effective screening tools for cervical cancer, breast cancer, colorectal cancer, and lung cancer. And even though their uptake is not as good as we would like, especially for lung cancer, the screening modalities for these diseases have had a dramatic impact on U.S. cancer mortality already.

I spoke with someone recently who had been diagnosed with early stage breast cancer, with screen-detected breast cancer found in a mammography. She described to me what an inconvenience this was, how it had been a little frightening at first, but then it just had become more of a hassle.

She'd had a minimal surgery and a brief course of radiotherapy, and was told that she would enjoy an excellent prognosis. That's really the kind of experience we want to see for more types of cancer. I mean, can you imagine anyone in 1971 talking about a diagnosis like that being an inconvenience? That's a problem that is in some ways a good problem.

But, even after many advances in detecting and treating cancer, the uncomfortable reality is that we still lack effective ways to detect many types of cancers before they spread and become more difficult to treat. The cancer types with some of the worst outcomes, frankly, are those where the disease can only be detected typically when it's too late to treat effectively—pancreatic cancer and glioblastoma, et cetera.

Lung cancer is an area where the National Cancer Institute's work should be highlighted. It's had an important impact on early cancer screening and early detection. I think this group will be aware of the National Lung Cancer Screening Trial, which was a landmark study led by the NCI that showed that CT scanning could reduce mortality from lung cancer in specific populations related to age and history of smoking.

This result was confirmed by a similar European trial, and now low-dose CT screening is really considered the standard of care for patients of a certain age with certain histories of tobacco use as an effective means of reducing lung cancer mortality. This is an example of how we can rigorously test that approach and move it into broad community practice, and then refine it further through study.

This is also an important illustration of some very critical nuances related to cancer screening. For example, the screening guidelines that were finally established in 2013 by the United States Preventative Services

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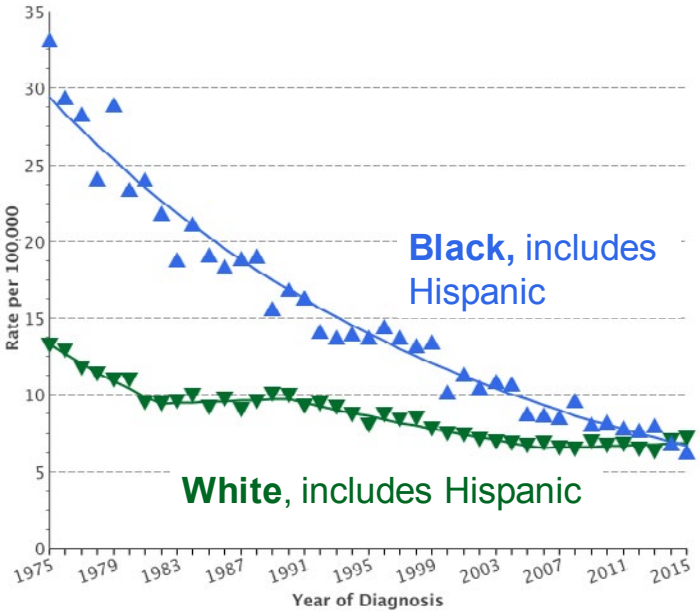
Cervical cancer incidence & mortality



- Est. new cases in 2020: **13,800**
- Incidence in black women is now similar to white women
- Mortality disparity remains

Current Mortality Rates
Annual Standardized Rate
2012-2016

Black women: 3.5
White women: 2.2

SEER data

Task Force, the USPSTF, excluded large numbers of patients from screening because of the cutoffs that were chosen.

This particularly applied to women and African American individuals who had lower smoking histories, not as many pack years. These individuals hadn't smoked enough to meet the cutoffs, but they nonetheless face a higher risk of dying from lung cancer. The NCI sought to address this issue by performing modeling in our CISNET network.

We concluded that screening guidelines should be amended to protect patients with a more modest history of tobacco use. Based on that work, the latest revision of the USPSTF guidelines for lung cancer lowered those thresholds, a change that is a particular benefit to female and African American smokers who are now eligible for screening. A side note, by the way—a similar recent USPSTF change was made to colonoscopy and colorectal screening guidelines, also based on NCI-sponsored CISNET modeling.

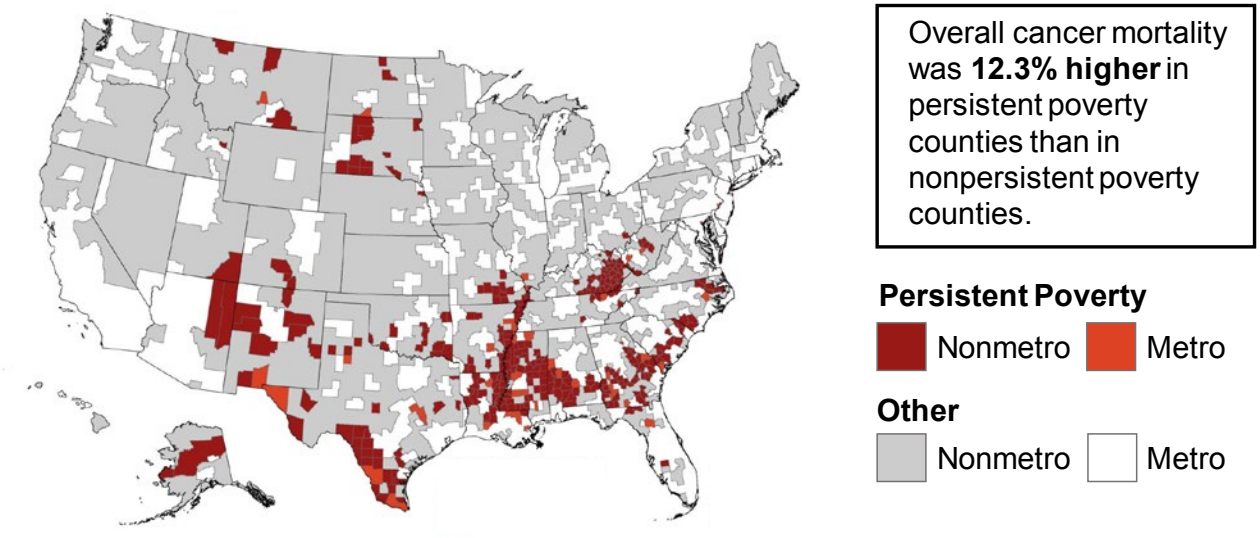
The main problem with lung cancer today is—this is vastly underutilized for reasons that I do not completely understand. We've modeled what a more robust uptake of lung cancer screening could mean in terms of overall cancer mortality in the United States. It's a real opportunity, and the NCI is funding many studies in this field of dissemination and implementation science to understand why an effective screening modality is so vastly underutilized.

The story of lung cancer screening shows how the NCI can play a really important role in developing the preliminary science, disseminating that, and then refining these recommendations all for public health benefit. Broader adoption of proven methodologies like lung cancer screening will be important, but there are also exciting new technologies for early cancer detection. One particular approach is the so-called multi-cancer early detection tests, or MCEDS.

The idea here is a single test, usually a blood test, done on otherwise healthy individuals at some regular interval yearly, to diagnose several cancers at once by detecting features of the cancer in a single analyte—the tube of blood. There are many approaches to this—there's DNA methylation, there's cell-free DNA, there's exosomes, etc.

I believe this concept holds great promise, and these technologies are evolving rapidly and entering large scale clinical testing as we speak. These approaches could potentially reduce cancer mortality

Persistent poverty and cancer mortality rates



Map: USDA, Economic Research Service using data from U.S. Census Bureau.
Study: Cancer Epidemiol Biomarkers Prev 2020 Oct;29(10):1949-1954.

at the population level, but they have to be rigorously evaluated in a timely manner.

ARPA-H

As I think this group is aware, cancer screening is a tricky business because there's always this worry about over-diagnosis and over-treatment and the ability to harm patients through cancer screening. Evaluating these technologies will be challenging. Parenthetically, for those of you who have been following news in DC, you will have heard about this new entity called ARPA-H, which at this point is still a proposal being taken up by Congress to create a new agency akin to DARPA. DARPA is the Defense Advanced Research Projects Agency, So ARPA-H would be the Advanced Research Projects Agency for Health.

This would be within the NCI, but with different structures and authorities to enable the rapid development of high-risk, high-reward projects. I believe, and others have also stated that, ARPA-H might be a good instrument for evaluating a new technology like this, as there's this very pressing need to evaluate these technologies as soon as possible.

Health disparities and workforce diversity

Let me turn to another major problem that we have failed to adequately address, and that is cancer health disparities, and inequity in cancer care. This is a whole constellation of issues that drive disparities and outcomes for our patients. We face important disparities in cancer diagnosis, in treatment, trial access, outcome based on race, region, access to care, socioeconomic status, and other things.

In other words, different demographic groups are affected differently by the health challenges they face and the circumstances in which they face it. Think about the challenges that many people with cancer face and how their specific circumstances impact their care and their experience.

Sherry Davis is a patient the NCI knows who needed cancer treatment in Florida, but couldn't find a doctor who would take Medicaid that was closer than three counties away. Another patient, Barbara Ingalsbe, drove 100 miles every weekday for radiation treatment.

Several states away, we had Albert Calloway, who had a neck tumor that grew and grew because this individual was uninsured and was

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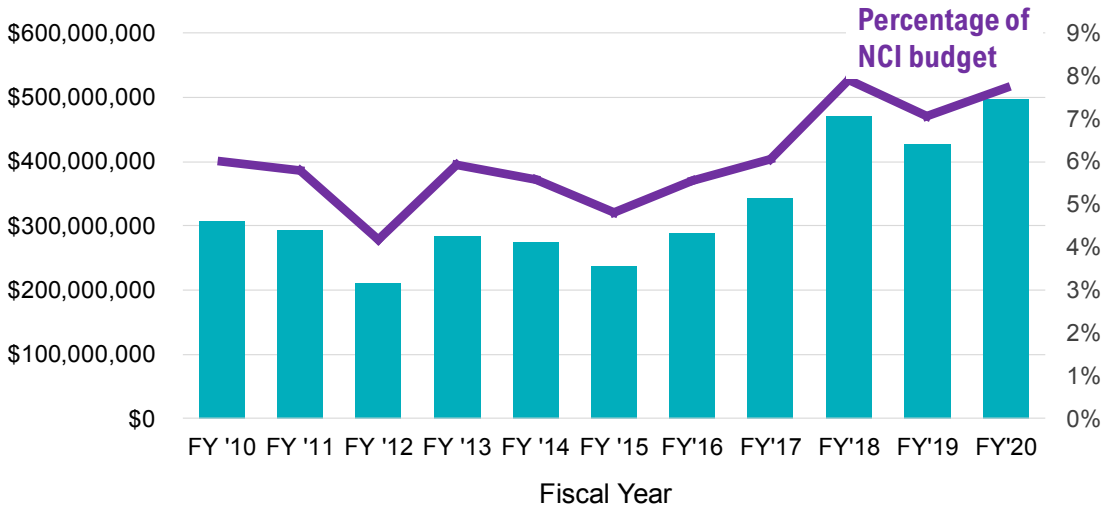
Trends in NCI Funding of Health Disparities-Related Research and Training FY 2010-2020



Source: NCI Center to Reduce Cancer Health Disparities, using RCDC Data.

overwhelmed by the process of trying to figure out how he fit within the healthcare system. These are three real patients and it's clear that experiences like this in the United States are entirely too common.

While we've made great progress in overall cancer research and care, these benefits have not reached all people equally. The NCI has long sought to address cancer disparities. We were working in this area even before that term, healthcare disparities, really was available in research.

Of course, recent events, and I'm talking about the death of George Floyd, and the disproportionate impact of the pandemic on the poor and disenfranchised. These recent events have injected, and rightfully so I believe, a new focus and passion and commitment to addressing disparities in the entire NIH, including the NCI. That said, these problems are very hard. If their answers were easy, we'd have solved them by now.

Cervical cancer is an interesting example of the complexity of cancer health. So here is a graph showing the incidence of this disease over time, and it shows a very positive trend. There's been this remarkable decline in cervical cancer incidents in the United States over the last few decades.

We have completely eliminated the difference in incidence between African American and white women. This is good news, and it reflects increased screening for cervical cancer, as well as an effective HPV vaccination. While we should celebrate this progress with regard to this important healthcare disparity, we should also note at the same time that a very large difference in mortality from cervical cancer still exists today.

Even today, Black women in the U.S. are more than 50% more likely to die of this disease than white women. First I think as a scientist, you just have to admit, this is interesting. How can we have so much progress against incidence and not mortality? And why is this cancer so much more lethal in Black women than white women? One can invoke a lot of explanations for this. This could be differences in biology, or differences in risk factors, or differences in access to care, structural racism in the healthcare system, all of these explanations have plausibility.

In cancer health disparities, let me tell you, it's generally not one of these. It's going to be a combination of multiple things creating these disparities, but it's really the

NIH Faculty Institutional Recruitment for Sustainable Transformation (FIRST)

Morehouse School of Medicine	FIRST **Coordination and Evaluation Center** to promote inclusive excellence (U24)
Cornell University	Cornell FIRST
Icahn School of Medicine at Mount Sinai	NIH FIRST Cohort Cluster Hiring Initiative at Icahn School of Medicine at Mount Sinai
Drexel University	Catalyzing Systemic Change at Drexel University to Support Diverse Faculty in Health Disparities Research
University of Alabama at Birmingham	UAB/Tuskegee Faculty Institutional Recruitment for Sustainable Transformation (UAB/TU FIRST) Partnership
Florida State University	Fostering Institutional Resources for Science Transformation: The FLORIDA-FIRST Health-Science Brigade
San Diego State University	SDSU FUERTE: Faculty United towards Excellence in Research and Transformational Engagement

business of the National Cancer Institute to figure this out. We should support the research that would identify the causes of these disparities. That's really the key to fixing these problems.

Race and ethnicity are two features of society that drive healthcare disparities, but there are many other important contributors. Increasingly, we're appreciating that cancer outcomes are driven by geography, which we think is related to access. For example, we know that people who live in rural communities have worse cancer outcomes, regardless of race or ethnicity.

Cancer incidence and mortality overall are higher in rural areas than in urban ones. This has not always been true in the United States. In the early 1990s, rural patients did better than urban patients, but that trend has reversed and the disparity between urban and rural patients gets worse every year.

This observation holds true for cancer overall, but particularly for cervical cancer, colorectal cancer, kidney cancer, lung cancer, melanoma, and oropharyngeal cancers. Along these lines, a recent study from NCI grantees published this month revealed that women residing in urban areas were significantly more likely to get the recommended colorectal cancer screening compared with women in rural states areas of 11 states.

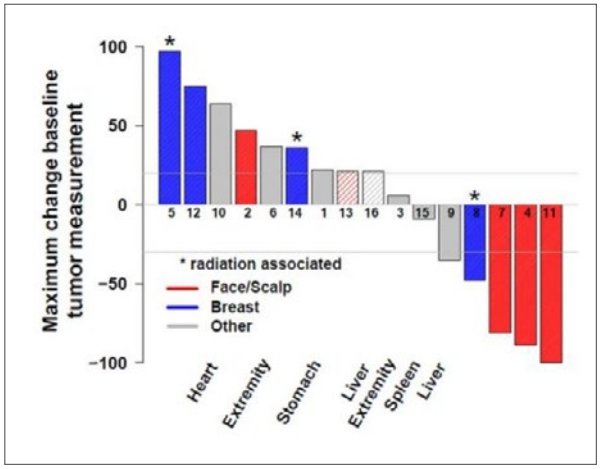
However, both groups had similar rates of adherence to breast cancer screening, sort of showing how complex this is. You sort of get a different effect of rurality on colorectal cancer screening versus breast cancer screening. That is, colonoscopy versus mammography. But perhaps the most important thing to realize about health disparities research is really the need to stop solely focusing on a single feature of these complex heterogeneous populations. Shown here is a beginning to try and get a handle on this.

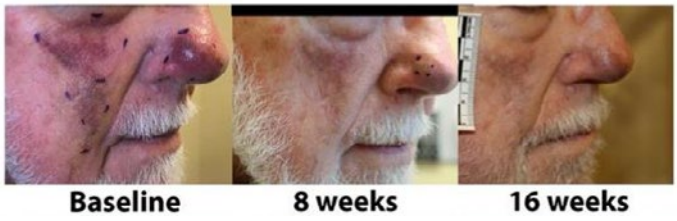
This is the topic of persistent poverty, which is defined as 20% of the population living below the poverty threshold for decades. We note that the outcomes of patients living in areas of persistent poverty are worse than patients who are living in areas that are merely currently poor. That is that they're socioeconomically the same today, but one is that structural poverty going back decades, and that population does worse. Socioeconomic status alone can't really capture what's going on here.

We need more sophisticated approaches to understand this interaction between rurality and poverty, particularly through time. We have other examples, for example,

DART: Dual Anti-CTLA-4 & Anti-PD-1 blockade in Rare Tumors

Recent results in angiosarcoma





DART | SWOG 1609

- Launched in 2017
- 53 cohorts based on condition
- Recruitment for some cohorts ongoing

SWOG 1609, Cohort 51. ClinicalTrials.gov Identifier: NCT02834013
Wagner MJ, et al. J Immunother Cancer 2021;9:e002990. doi:10.1136/jitc-2021-002990

the American Indians where overall cancer outcomes are not that bad, but the interaction with poverty in that population is particularly adverse, and we see these terrible pockets of very poor outcomes in the American Indian population, for example.

We have lots of data now showing these nonlinear interactions between things like race and ethnicity and genetics and poverty and rurality, and these interactions can produce some really counterintuitive effects. A key for cancer disparities is to stop single-variable analyses and start working on these populations in their totality, with all their complexity.

As mentioned, the NCI has been interested in the topic of health disparities and minority health for some time. This shows a trend in our funding for these topics dating back to 2010. The NCI has had a significance in this area for over decades, but you can see that has sharply increased in the last few years. Although this is a large investment in this area of science, we believe it is very important to continuously monitor this portfolio, and we think it's fair to ask if we're spending on the right topics, or asking the right questions for this field, and spending more in these areas.

We also know the cancer research workforce, the scientists and doctors that do the cancer science, that workforce does not reflect the population of the people we serve. We've really redoubled our efforts to make headway against the problem of underrepresentation within the cancer research workforce.

We all share responsibility to change this in whatever way we can and to bake health equity into sort of everything we do. That's, we believe, an important key to ending cancer as we know it—the president's goal. Given the lack of diversity in the cancer research workforce, I am excited about several efforts in the NCI to address this problem.

One that is reasonably well known is the NCI's CURE program. This is the Continuing Umbrella of Research Experiences. This program is a pipeline program that starts in middle school or high school. It provides support for individuals all the way to the junior faculty level. It has thousands of alumni. Some of the most famous researchers in cancer going today are alumni of the CURE program. It really trains them for success. It is the idea that a pipeline is a way to address the lack of representation in science.

Another effort that is different, that is really exciting, is shown here. This

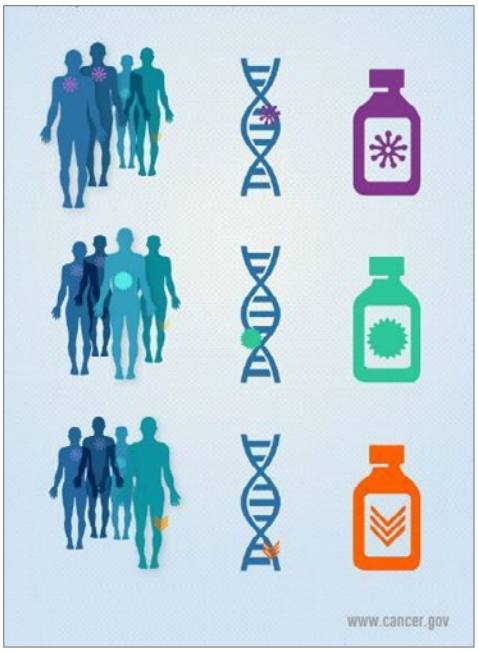
NCI Molecular Analysis for Therapy Choice (NCI-MATCH)

60% of MATCH participants have rare cancers

MATCH successor trials

- NCI-COG Pediatric MATCH
  open, recruiting
- Myelo MATCH
  opening next year
- Combo MATCH
  accepting subprotocol proposals

The NCI-MATCH trial is open and enrolling patients at nearly **1,100 cancer centers and community hospitals** in every state, the District of Columbia, and Puerto Rico.



is the FIRST initiative. FIRST stands for the Faculty, Institutional Recruitment for Sustainable Transformation. This is a Common Fund initiative, meaning the money to support this comes from the NIH, but is led by the NCI, working in collaboration with National Institute on Minority Health and Health Disparities, NIMHD.

The purpose of the first cohort is to transform the culture at NIH funded extramural institutions, by building a self-reinforcing community of scientists, committed to diversity and inclusive excellence. The rationale here is that a cohort model of faculty hiring sponsorship and mentoring will really sustain support for professional development embedded within an institution that's committed to workforce diversity.

Here's the first set of awardees. There are two more rounds of this coming. In fact, the next round of grants is due soon. You see it as a coordinating center at Morehouse and then six awardees. It's an experiment in this cohort approach, which will include some significant data collection to see if the scientists, the faculty trained through FIRST, will benefit from this program.

You see, the NCI invested in the cohort approach with FIRST, and the pipeline approach through CURE, and we are really trying to consider whatever approach might work best in terms of developing faculty diversity.

Rare and refractory cancers

Let me also talk a little bit about rare and difficult to treat cancers. Just as our advances in cancer research have not benefited all populations, our progress has not been even across all cancer types. You see here, Senator McCain who died of glioblastoma, Ruth Bader Ginsburg, who died of pancreatic cancer, Chadwick Boseman, who died of early onset colorectal cancer.

We are seeing an alarming rise in the rate of colorectal cancer in young patients for reasons that are not clear., The five-year survival rate for glioblastoma, that which affected Senator McCain, is less than 7%, pancreatic cancer is less than 11%. But among these stories, you also see in the upper left corner here, a little girl named Rihanna who had infantile infantile fibrosarcoma, which was heretofore a terrible disease. She was treated with larotrectinib, a TRK inhibitor that allowed her to avoid amputation.

Hers is a success story in a rare cancer that speaks to the long arc of

Childhood Cancer Data Initiative

CCDI Annual Symposium

November 9, 2021
Register at cancer.gov

Childhood Molecular Characterization Protocol

- Open to all children with cancer
- Will provide clinical and molecular information to every child with cancer
- Builds on *Project: EveryChild*
- Will characterize ~3,000 children with hard-to-treat cancers

National Childhood Cancer Registry

- Integrates data from registries, hospitals, research centers, insurers
- Will generate accurate count of cancer cases
- Database to expand with genomic and tumor characteristics, treatment info, recurrence indicators, etc.

basic science discovery to successful clinical advance. The story of TRK inhibitors for those of you who know it, begins really at the NCI, at Frederick National Lab, back in the 1980s, when Marino Barbacid, working at NCI as a contractor, was hunting for oncogenes, and he found one called onc-D, which turned out to be the first fusion known in cancer involving the TRK gene.

In 2018, larotrectinib, which was used in Rihanna's cancer, was the first drug approved to treat NTRK gene fusions. It is quite a successful drug for those rare patients that have those events. Another nice example is the DART trial. This is the NCI Dual Anti-CTLA-4 and Anti-PD-1 Blockade in Rare Tumors.

It's the first immunotherapy trial focused on rare cancers. The DART trial has been tried in many different rare cancers. Here are the results in angiosarcoma, where you can see a patient with a quite bad tumor involving the face and nose, with this very nice response to combine the immuno-oncology approaches.

These results are impressive and encouraging. You can see in about a quarter of the patients, there are these very impressive responses with some patients having their cancers go away entirely. This is remarkable for a number of reasons.

A subtype of angiosarcoma that had been defined earlier through the Count Me In initiative that included about 25% of patients that had high tumor mutational burden and would therefore be a candidate for immuno-oncology. And then this trial happens almost within a year to confirm activity in some patients. The DART is an important platform.

It is not, as I said, solely restricted to angiosarcoma. It is looking at other rare subtypes of cancer, 53 cohorts in all, including cancers of the ovary and intestines and lung and sinuses—rare cancers, wherever they may be found. We think that this is the kind of approach that really has to be taken for these kinds of rare cancers that are not amenable to traditional clinical trials.

The MATCH trial employs this basket approach. When MATCH started, the idea was to sequence patients with refractory cancer and then allocate them to therapy in one of the 40 treatment arms based on the molecular genetics of the tumor. When we started, we thought this might appeal to some patients with rare and uncommon cancers, but in fact, the trial really exceeded our initial expectations with about 60% of those enrolled on MATCH, having cancers other

What it will take to end cancer as we know it

Build on 50 years of progress	**Advance health equity**	**Personalize cancer care**
Embrace technology and innovation to learn from every patient	**Inspire the next generation of diverse researchers**	**Prepare for the challenges of the future**

than colon, rectal, breast, non-small cell lung, prostate.

It preferentially enrolled patients from less common cancer types and turned out to be a great rare cancer framework. MATCH, for example, has shown promising results in treating HER2 amplified salivary gland tumors, a rare cancer subtype, treating these patients with T-DM1, producing significant responses in a fraction of the patients.

MATCH is also remarkable as one of the fastest enrolling clinical trials ever done at the NCI. It enrolled patients at 1,100 sites—6,000 patients in just a few years. I think things like MATCH and DART really established this basket trial approach as being quite successful.

Childhood cancer is collectively rare, comprising approximately one to 3% of cancers diagnosed in the United States. This rarity is, as I said, no comfort to anyone who's watched a child suffer from cancer and its treatment, and it makes our quest to end childhood cancer challenging.

There just isn't enough data in any sort of one tumor type to really do some of the traditional clinical trials we think of. And so one effort to try and address this problem is the Childhood Cancer Data Initiative. This is a 10-year effort that's really just begun. It's in its second year. The idea here is to try to radically aggregate data from children with cancer to make them maximally informative for research and for improved clinical care.

Two important parts of the CCDI are shown here, the Childhood Molecular Characterization Protocol, which would sort of establish a floor of molecular analysis available to every child with cancer United States, and then a National Childhood Cancer Registry, which would try and learn from every trial that would get some data through integration of registry data and various other sorts of datasets that we have to try and get an idea of what happens during the experience of cancers for all children with cancer in the United States. We think these are really important efforts to try and do better in childhood cancer, a collection of rare diseases.

Having discussed some of the challenges we face, cancer as we know it today, the reality is that we will still need more progress for early detection, disparities, and advances in rare and difficult to treat cancers. There are some questions thrown in this slide that are equally important that I haven't touched on today.

But really, I think they spur us to think about what the future will look like. What are we working toward? If we're building a bridge to the future of cancer, what's on the other side of that bridge? A world where these statements are no longer true, where we will have changed cancer as we know it. And I think that future is within our reach. Let's focus on a future where all people with cancer have the support and resources needed to navigate their care.

Let's build a reality in which your location, or your race, or your education doesn't predict the outcome of your disease. And let's take what we've learned and create tests that identify cancer at its earliest stages. And let's ensure that once these cancers are detected, each cancer can be treated and treated effectively.

This is what the NCI thinks it will take, over this next period. We've had this 50 years of progress, now we need to build on that 50 years of progress to advance health equity, to personalize cancer care, to embrace new technologies and innovations, to inspire the next generation of cancer researchers, and to prepare for the challenges of the future.

We know what we don't know

This is a set of guideposts, the foundations on which we'll build this bridge to the future. I would argue that we need to look at all our work through a lens of health equity, we need to ask to what extent might this study reinforce existing inequities, or might reflect hidden biases.

You can clearly see how these guideposts are interwoven and overlapping and building the next generation of diverse researchers as part of embracing innovation and creativity.

Today in our age of rapid progress and technical and medical advances, it may be easy to discount the importance of the National Cancer Act. But as 1776 was our nation's history, and 1969 was the Apollo program that put a human on the moon, 1971 really marks the modern era of cancer research. Maybe this comparison strikes you as a little bit over the top, but I do not believe that is so. Ending cancer as we know it will be as big of a deal for humanity as landing someone on the moon.

1971 is really what got us started. That's why this anniversary is so important. It was signed into law at a time of great need for those people who feared cancer so much, which at the time was basically everyone. The NCA's first 50 years was the work of people like Mary Lasker, optimistic politicians, and pioneering oncologists and researchers who were visionary, as I said, but also naïve, as I said.

The optimism induced by the legal mandate and strong infrastructure was soon tempered by the realization that this objective was going to be so challenging. The years ahead will be sharper and focused, different in tone, and more practical, more cognizant of the size and timelines of these challenges, and more based on the foundational molecular biology and biological understanding of cancer.

Over the past five decades, many of us declared, 'This time is different.' They weren't wrong, and that's what's brought us so far today. Each time we try this is different. It was reportedly Heraclitus who observed that no one ever steps in the same river twice, the river changes.

In cancer research, we have past thresholds, as compared to 1971. We now have a molecular understanding of these diseases and we're ready to take a crack at this again. I've been trying to make this point for a while now, and I found, actually, a really good analogy that I like a lot, in an excellent book on the history of the National Cancer Act by Abbe Gluck and Charlie Fuchs, both of Yale, entitled *A New Deal for Cancer.*

It makes a point that I've long believed: it points out the optimism for so many of the players held for the rapid cure in 1971—for example, Sidney Farber said he thought a cure for cancer could be achieved by 1976—but as the book notes, the foundational understanding of cancer hadn't really been grasped in 1971.

There's this quote from Sol Spiegelman, who was director of Columbia's Institute for Cancer Research, that I really like, which says, "An all-out effort at this time would be like trying to land a man on the moon without knowing Newton's laws of gravity." Fifty years later, we know what we don't know, and that's what's changed. We know how we're going to end cancer as we know it, when before we really didn't know that.

Whatever our progress or whatever our successes, it's certain that they will be possible only because of the work of the last 50 years. And it really built on the work of individuals like Paul Calabresi and the legislation that enabled so much of this work.

I suspect that those who worked so hard to get president Nixon's signature in 1971 might've been disappointed to know that a half century later we're still losing 600,000 Americans each year to cancer, but I hope they would be gratified to learn that despite the fact that the problems turned out to be so much more complex than we ever imagined, the passion, inspiration, and dedication of the generations that followed have led to astounding progress nonetheless.

Thank you for the opportunity to speak today.

Roy Herbst [Ensign Professor of Medicine and professor of pharmacology; director of the Center for Thoracic Cancers; chief of medical oncology, Yale Cancer Center and Smilow Cancer Hospital; associate cancer center director, translational science]: Thanks Ned. That was wonderful. I think Paul is probably watching from up high and very happy to see all the progress. It's our tradition at the Calabresi Lecture to ask his brother, Guido, to ask the first question, and I see Guido is on in Italy. Guido, can you hear me?

Guido Calabresi [Paul Calabresi's brother, Senior Judge of the U.S. Court of Appeals for the Second Circuit, former dean of Yale Law School]: Here I am. I'm in Italy. Can you see me? And can you hear me?

Herbst: We can, this is wonderful.

Guido Calabresi: I was delighted with the lecture because 50 years ago, Paul said to me that the aim was realistically not to end cancer, but to get so that a cancer diagnosis was no different from a diagnosis of high blood pressure or of cardiac problems. So that somebody might live for the longest of time or shortest of time—but that cancer was not a death sentence, but was a life sentence to be dealt with decently and well. And this lecture was so much in that line that it made me smile because that's what Paul was about.

But there's something else in this lecture, which really struck me. And that was the continuing difference, even when there are diagnoses at the same time, in results among people because of race, because of poverty, because of all the things that have cursed us in America over so long.

And I just wonder how much—the fact that monies are being given to cancer, as they should, because cancer is such a dramatic disease in people's mind— how much this can be used, not only to diminish these differences in cancer treatment, but in treatment of diseases, generally? That is, using what is needed to make cancer treatment more equal to different people based on race and poverty, so that all medical treatment becomes more equal in this country. Thank you.

Sharpless: Well, thank you, Judge Calabresi. And it's a very important question and I think a really important point to make is that addressing the things that drive disparities in health outcomes in the United States will not just benefit patients with cancer.

They would benefit, presumably—we actually have very strong evidence that they would benefit individuals for lots of diseases and would improve health in many ways for the public. So, think about something like tobacco control, which has really been quite successful in certain populations in the United States and not so successful in other populations. Continued use of combustible tobacco correlates with low socioeconomic status and less education. And if we could reach those pockets, the benefits of tobacco control would be way beyond cancer. They would go to many other diseases and general health.

So, it's a really important question. And we think that—through the last, I'd say 20 years, the NCI's become very interested in this topic of dissemination and implementation sciences. When you know something works, it works just fine at the tertiary cancer, excellent outstanding academic hospital, but then it doesn't translate down to the community. What happened there? Why doesn't that work? And where do things break down?

Obviously many of these things are ascribable to things that we know a lot about—the fractured nature of U.S. healthcare, inequities in education, for example, in the United States.

But, I'm struck by how often disparities are often driven by things that we didn't appreciate as being so important. For example, a study in disparities in ER-positive breast cancer by race showed that a large part of the disparity was driven by adherence to therapy of the medicine. So, it was really the ability to continue to take the medicine because of the cost of the medicine or presumably the hassle of going to the pharmacy.

I think we had lots of reasons in our mind why that disparity existed, but one of the main drivers was really something so narrow and addressable. So, that's why I think this line of research is really important. Obviously, the NCI, whether it's me or on the order of $7 billion a year budget, can't fix care and education in the United States. Those are much

bigger problems, but I think we can do the foundational science that explains what's really driving these inequities.

Herbst: Thanks Ned. Steven Calabresi has a question.

Steven Calabresi [Paul Calabresi's son, the Clayton J. and Henry R. Barber Professor of Law at Northwestern, co-founder of Federalist Society]: Thank you, Dr. Sharpless for that presentation. It was really wonderful. There may be an easy answer to this question. But I was curious, given the recent advances in immunotherapy in treating cancer, and given the remarkable success of the mRNA vaccines that Moderna and Pfizer developed against COVID, is there more work to be done on vaccination to prevent cancer? And is that a field that is potentially worth looking into in the future?

Sharpless: Yes. I think that the mRNA platform is very exciting and particularly for the potential, what are called bespoke, totally personalized medicines and certainly an area we've been thinking a lot about. Moderna, I think you're probably aware, started out as a cancer company. Some of their initial products were targeting cancer. And I think Moderna pivoted for a variety of reasons related to technology to vaccines, but still has an interest in cancer and is still supporting clinical trials and cancer patients. And so, I think that this approach makes a lot of sense in the area of personalized vaccines, but maybe other areas as well.

I can tell you that I have one concern about it, that we don't talk about very much, but I think we should probably talk about more—which is that, having spent time at FDA, the regulatory pathway for bespoke medicines is entirely unclear to me.

It is not certain how you would take medicine that you intend to use in one individual and make that into an FDA approved product under current law. Frankly, I know this is a big turnoff to many of the industry partners in this space who are worried about how they would make a viable product. Even if you could use it in thousands of cancer patients, if the product is different in each patient, a different molecule in each patient, how is that going to work from the regulatory framework?

I think we need some clarity on this topic. I think the FDA needs to provide further guidance on bespoke products and perhaps we even need legislators to write new law in this area. But it's really exciting, and it goes beyond cancer, by the way. There are many, many rare diseases, particularly rare diseases of children, where these highly personalized medicines can be valuable as well. So, I think as a society it's really pressing, we figure this out.

Steven Calabresi: Great.

Herbst: Well, listen, we're at the hour, but we have one special guest. And before I do that, I just want to remind the fellows that we have a half an hour virtual lunch with Dr. Sharpless. So, please stay on this very line. But I'm really excited—Eric Weiner, are you on?

Eric is our new director and actually he gave the Calabresi Lecture about eight, nine years ago. And Eric, I'd just love for you to say a few words, if you have time. I think we missed our window. Well that's okay. So, Eric was a Calabresi lecturer. We're very happy that he was here today and he heard your talk, Ned. And I'm sure you have business with him in the not too distant future.

Sharpless: Yeah, I've known Eric a while given the Boston connection, and I think what a great development and turn of events to see assume a leadership role at Yale. At the NCI we look very forward to working with him.

Herbst: Great, well, listen, this has been absolutely fantastic. We had one of our largest turnouts for Ground Rounds in the virtual era. What we're going to do now is I'm going to thank you, Ned. And thank you, Vince. Ned and Vince are going to stay on with me with the fellows. Calabresis, you're welcome to join us with the group and our trainees, who I'd love to hear a little bit more about these last 50 years, because you're the ones who are going to take us forward in the next 50 years. So, it's just been a wonderful day and we'll look forward to seeing everyone in New Haven in person sometime really soon. So, thank you all very much.

Guido Calabresi: Thank you all. I will go back to picking olives in Italy. Thank you.

Herbst: Bye. We'll see you soon, Guido. Thank you.

OBITUARY

Elihu H. Estey: Leukemia expert, statistician, gentle soul and friend

By Roland B. Walter, Andreas Hochhaus and Robert Peter Gale

> Life is short. Don't do the same thing everyone else is doing—that's such a herd mentality. And don't do something that's two percent better than the other person. Do something that changes the world.
>
> *– Oren Etzioni*

Prof. Elihu (Eli) H. Estey, MD, a pioneering AML researcher, physician and scholar collapsed and died unexpectedly on Oct. 8 at his home in Seattle. He was 75.

Eli grew up in Brooklyn, New York, attending Poly Prep Country Day School, where he believed a major part of the development of his critical thinking took place. He and Robert Peter Gale lived two blocks apart and frequented the same afterschool candy store.

He graduated from Yale University with a major in mathematics in 1968 and received his MD degree from Johns Hopkins University in 1972. His post-MD training was in medicine and neurology at New York University-Bellevue Medical Center.

In 1978, Eli moved to Houston to begin a fellowship in oncology at MD Anderson Cancer Center, intending to specialize in neuro-oncology. There he met his lifelong mentor and colleague Prof. Emil J Freireich.[1]

Under Freireich's influence, Eli redirected his career to leukemias as a fellow and assistant professor in the Department of Developmental Therapeutics.

Many people were surprised by the collegial and personal relationship between Profs. Freireich and Estey. In many ways, they seemed opposites, Spinoza and Maimonides (Teach thy tongue to say *I do not know*' and thou shalt progress). However, they saw the genius in each other for which we are fortunate.

From 1983 to 1984, Prof. Estey worked as a cancer expert at the NCI Investigational Drug Branch of the Division of Cancer Treatment. He returned to MD Anderson as an associate professor and became a professor in the Department of Leukemia in 1993 and chief of the Section of Acute Leukemia and Myelodysplastic Syndromes in 1997.

In 2008, he and his family moved to Seattle, where he became a professor at the University of Washington and Fred Hutchinson Cancer Research Center. There, he built one of the largest clinical AML programs in the US that quickly gained national and international prominence. Roland B. Walter was privileged to learn from and work with Eli as his mentor and close friend over 13 years.

Improving the lives of people with leukemia was his lifelong passion. His tools were astute observation, hypothesis testing and especially rigorous data analyses. An *out-of-the box* (heretical?) thinker, he would routinely question or challenge the validity of widely accepted medical practices.

A randomized trial comparing a cooked (neutropenic) *versus* a normal diet in people receiving intensive remission induction chemotherapy for AML is an example.[2] A specialized neutropenic had no advantage over normal food, only making patients' lives worse during difficult times.

He critically interrogated data behind many other standards-of-care practices, relying on his expertise in mathematics and statistics. Prof. Estey was a great fan of Bayesian statistics (no frequentist he!) and worked extensively with his good friend Prof. Peter F. Thall to develop adaptive clinical trials designs which could give reliable answers absent randomized controlled trials.[3]

Several of his studies were practice-changing. For example, he introduced the concept of bypassing chemotherapy and treating acute promyelocytic leukaemia only with all-trans retinoic acid and arsenic trioxide, now the *standard-of-care*. Eli authored nearly 700 peer-reviewed articles, including several with us.

In a series of articles in *Leukemia*, where he served many years as an associate editor, he was brutally honest about what we know and more about what we don't know about treating AML and his objection to several recent US FDA drug approvals.[4-8] Although it's unusual to have reference in an obituary several of these are must reads for critical thinkers.

Other contributions were the recommendation not to monitor persons with AML in remission with serial bone marrows thereby saving them unnecessary distress,[9] the cut-point of 20 percent blasts to define AML,[10] a threshold he later challenged and doubt about the validity of complete remission with incomplete haematologic recovery as an outcome endpoint in AML with equal weight to complete remission.[11]

He was a member of several expert panels such as the European LeukemiaNet, where he helped formulate expert consensus opinions and clinical practice guidelines and advised the FDA on the merit of new drugs. Eli was unsurprisingly critical of such processes, often quoting Abba Eban: "Consensus means that lots of people say collectively what nobody believes individually."

Scientific sessions on AML were often memorable because of Eli. Fear gripped presenters when he raised his hand and sauntered to the microphone. He would often ask one or more pointed questions others didn't think of asking or were afraid (or too polite) to ask. Following highly complex, overly technical presentations, he would phrase his question from the position of a simple country doctor.

A humble person, Eli didn't seek personal attention or an opportunity for a display of sarcasm. Rather, he was out to satisfy his curiosity about what others thought (or didn't think) of their data. Many presenters struggled to answer.

Eli's inquisitive nature and medical belief could often be distilled into simple sentences such as "no drug too stupid to test." This was not disrespect for science—he had great respect for scientists and rigorously conducted experiments, but rather the acknowledgment that many effective drugs were discovered empirically, whereas many drugs brought to clinical testing based on strong preclinical rationale and data ultimately failed.

He felt strongly drug that testing is inherently comparative and needs controls, even in phase II. To his dismay, this requirement is often overlooked, a likely explanation why many drugs with most promising results from uncontrolled phase II studies ultimately fail.

He proved this in a devastating analysis of the final outcomes of American Society of Hematology annual meeting presentations reporting "encouraging results," "proof-of-principle" or "warrant further study" and other euphemisms.[12]

Eli loved to challenge trainees and colleagues to think critically. House-staff and fellows were asked: "What was the patient's peanut butter hydrogenase?" when laboratory results were read from the medical record without context of the patient's illness or its significance weighed.

To remind people of the extraordinary costs of health care associated with unnecessary testing, he would hand out dollar bills to perpetrators. But he was also thrilled when someone with an interest in AML approached him. He was an avid and dedicated teacher, a medical Socrates. A mini-Luddite, he kept a several pages-long list of clinically rel-

evant yet often overlooked questions and reviewed it with each mentee to find a project right for them. He advised them, for example, that "the plural of anecdotes is not data."

Eli took pride in his AML database, which he diligently curated and used as basis for many of his groundbreaking studies. While striving for and adhering to, the strictest scientific standards, his approach to research was practical and grounded in reality directed to moving leukemia therapy forward.

His motto: "Don't let the perfect be the enemy of the good." Let's take advantage of whatever small progress we make.

Prof. Estey was the best kind of clinical trialist. Yet, he stressed that "the point of a protocol is to treat the person," reminding us that research is only a pathway to our primary purpose: caring for people. In a recent obituary for Prof Freireich, Eli quoted him saying; "The primary beneficiary of clinical research is the patient participating in that research."[13]

Eli's version was, "Don't let the protocol or data interfere with your primary responsibility as a physician." He bonded easily with his patients, who adored him. His "prepare for success" mindset assured them, and he oftentimes took paths which might frighten others. Interestingly, some aspects of Freireich's and Eli's concept of clinical trials participation is at odds with the notion that participation in a randomized controlled trial is for the benefit of future people.

Over a long career, Prof. Estey mentored many physicians, who have become leaders in hematology today globally. His scientific collaborators are myriad and too many to mention. He and Prof. Judith E. Karp were born on the same day (Linda Ronstadt also), called themselves twins and spoke for an hour every Saturday on a wide range of topics, including leukemia, politics, and sports (Judith was a listener on the latter).

Eli was kind and unobtrusive in his guidance and generous with crediting trainees and junior faculty. He took great pleasure in watching his mentees' projects evolve under his benign supervision. (He could not tolerate fools or phonies.)

Many remember early morning walks during meetings to catch up socially and discuss anything from politics to professional sports, of which he was a huge fan and, unsurprisingly, knew all kinds of statistics about.

> "Eli was a gentle soul, a true gentleman, not by dress code, but demeanor, capable of building bridges between people with different and sometimes difficult personalities."

He applied his mathematical background to organizing a betting lottery during the college basketball championship, a beneficent Meyer Lansky. Each week he awaited with equal enthusiasm the *New England Journal of Medicine* and *Sports Illustrated*.

Elihu (אֱלִיהוּא), his namesake, is a character from the Book of Job (32:2). Elihu, a descendent of Abraham, makes a brief appearance in which he criticizes Job and his three friends, claiming God is supreme and that one must acknowledge and submit to that supremacy because of God's wisdom.

Why Eli's parents so named him is unclear, but for our Elihu, God was reason and rationality. It's likely he was the only boy in his class with this name which may have spurred critical thinking and developing boxing skills.

Eli was a gentle soul, a true gentleman, not by dress code, but demeanor, capable of building bridges between people with different and sometimes difficult personalities. He held some unconventional views, and in debate he was always thoughtful and respectful, always playing the topic, never the person.

To those who knew him, Eli was someone bigger than life, not only in science, but in his humanity and sense of humor. He would love to just sit down and talk with people (he brought potato chips to share).

A rigorous clinical scientist, an impactful thought leader, a wonderful academician, a professional and college sports connoisseur, a fierce advocate for women's rights and equality, and a tremendous friend, he will be thoroughly and sorely missed.

In Eli's own words, "If you have two quarterbacks, you have no quarterback." We just lost ours. A one-of-a-kind *mensch*.

Eli is survived by his wife, Cynthia David, an accomplished radiologist in her own right, his children Andrew and Emily, and his beloved dog "Hutch".

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The authors are:

Roland B. Walter, MD, MS, PhD
Professor, Division of Hematology, University of Washington;
Professor, Clinical Research Division, Fred Hutchinson Cancer Research Center

Andreas Hochhaus, MD
Director, Department of Hematology and Internal Oncology of KIM II;
Speaker, University Tumor Center;
Vice dean of research, University of Jena

Robert Peter Gale, MD, PhD, DSC(hc), FACP, FRCP, FRCPI(hon), FRSM, LHD, DPS
Visiting professor of hematology, Imperial College London

OBITUARY

Edmund Gehan, creator of the "rule of 14" and the Wilcoxon-Gehan test, dies at 92

By Becky Slack Tidwell, J. Jack Lee, John Hanfelt and Donald A. Berry

Our good friend and colleague Ed Gehan passed away on Sept. 28 at the age of 92. Ed and his contributions to cancer research and to cancer patients are legend.

Ed began his career more than 60 years ago as a biostatistician at the National Cancer Institute.

He moved from the NCI to the University of Texas MD Anderson Cancer Center, then to Birkbeck College in London, and then to the University of Paris. Most recently he was Chair and Professor Emeritus in the Department of Biostatistics at Georgetown University's Lombardi Cancer Center.

Along the way he served as the group statistician of Southwest Oncology Group (SWOG) and the Intergroup Rhabdomyosarcoma Study Group (IRSG). Ed loved his role in advancing cancer science and in improving the lot of the world's cancer patients.

Ed was a wonderful mentor and colleague. He hired and mentored many of today's younger cancer biostatisticians. He instilled in them the need to understand the relevant scientific and

medical issues and how experimental results could inform them.

His mentees carry his legacy of collegiality and collaboration in every encounter and every publication, moving the needle forward in curing cancer.

Ed had a fresh and lively personality. Working with him was inspiring. He made the most of life while enjoying working in his profession.

At Georgetown, Ed established the department's shared Friday lunch as a fun tradition. And he would routinely treat his junior colleagues to lunches at the French embassy.

His friendly demeanor and his conversational style—along with his statistical knowledge and expertise—attracted top students.

He invested in their personal lives as well as in their professional development. He recognized the need to build relationships with collaborators. Ed was equally joyful in working with enthusiastic young fellows as with long-term collaborators.

Ed was a pioneer in the early days of cancer research. His name is associated with important cancer trial designs and analyses.

In 1961, he published the design of a phase II multi-stage trial now known as the Gehan design. Physicians usually refer to a special case of this design as the rule of 14. Namely, enter 14 patients on a trial and if none respond then stop and conclude that the response rate is less than 20%.

That's the first stage of a Gehan design assuming a 20% response rate, which was commonly practiced for 30-odd years, with modifications of his design evolving into today's norm.

In 1965 Ed developed a non-parametric alternative to the log-rank test which he called the generalized Wilcoxon test. Others call it the Gehan test or the Wilcoxon-Gehan test. It is still a viable option for comparing survival distributions when the hazard ratios are not constant over time.

This test gives more weight to early events when more patients are still at risk, which is especially helpful for evaluating high risk treatments. Ed's article has more than 4,000 citations.

Ed co-authored 225 statistical and collaborative papers. In 1994 he published his important book with Noreen Lemak: *Statistics in Medical Research: Developments in Clinical Trials*.

Ed was a mathematical genius with a flair for writing, a rare combination indeed! His writings are elegant and concise. He continued writing in his post-academic life with the publication of "Memoir of a Number Doctor" in 2017, available for download here.

A scholarship fund was set up in Ed's name when he retired. This fund will keep his memory alive and will continue to draw promising students into the field of cancer biostatistics.

Donations can be made to the Edmund Gehan Scholarship Fund at Georgetown University's Department of Biostatistics.

Ed was preceded in death by his wife of 51 years, Brenda McKeon Gehan, and his brother, Donald Gehan. Ed is survived by his five children and ten grandchildren.

Children: James (Jennifer) of Wellesley, MA, Laura of Houston, TX, Carole (Scott) of Seabrook, TX, Diane (Jeff) of Austin, TX, Margery (Monica) of Annandale, VA.

Grandchildren: Matthew Counts, Caroline Counts, Michael Welsh, Audrey Welsh, Patrick Carpenter, Grace Carpenter, Andrew Carpenter, Luke Carpenter, Nicholas Gehan, Emma Gehan.

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1. *Gehan EA (1965) A generalized Wilcoxon test for comparing arbitrarily singly-censored samples.* ***Biometrics****, 52:203-223.*
2. *Gehan EA (1961) The Determination of the Number of Patients Required in a Preliminary and a Follow-Up Trial of a New Chemotherapeutic Agent.* ***Journal of Chronic Diseases*** *13(4):346-353.*
3. *Gehan EA and Lemak NA.* ***Statistics in Medical Research: Developments in Clinical Trials*** *1994. Springer, Boston, MA.*

The authors are:

Becky Slack Tidwell, MS
Senior biostatistician,
Department of Biostatistics,
MD Anderson Cancer Center

J. Jack Lee, PhD, MS, DDS
Professor of biostatistics,
Department of Biostatistics,
Division of Basic Sciences,
MD Anderson Cancer Center

John Hanfelt, PhD
Professor, biostatistics
and bioinformatics;
Director, biostatistics/
epidemiology program,
Georgia Clinical and Translational
Science Alliance;
Rollins School of Public Health,
Emory University

Donald A. Berry, PhD
Professor, founding chair,
Department of Biostatistics,
Division of Basic Sciences,
MD Anderson Cancer Center;
Senior statistical scientist, founder,
Berry Consultants, LLC

IN THE ARCHIVES

CANCER HISTORY PROJECT

From naïve beginnings: Oral histories and the future of NCI

Uromigos podcast launches a series with the pioneers of GU oncology
By Alexandria Carolan | Nov. 4, 2021

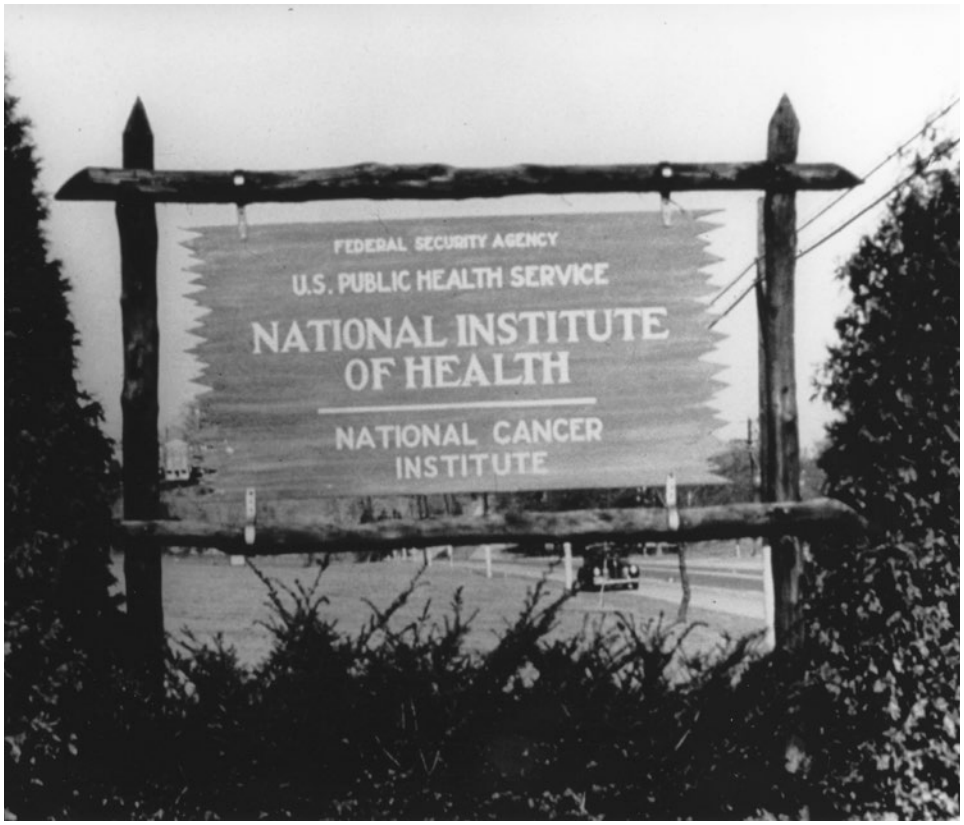
Brian Rini and Thomas Powles are documenting genitourinary oncology history in a new series on the *Uromigos* podcast.

"People don't know the early stories," Rini, chief of clinical trials, Ingram Professor of Medicine, and professor of medicine at Vanderbilt-Ingram Cancer Center, said to *The Cancer Letter*. "We'll say, 'Take us back to your early faculty days and what you were doing. How'd you get interested in GU cancer?' Everybody has a really interesting route."

In the Uromingos podcast, Rini and co-host Powles, professor of genitourinary oncology, lead for solid tumour research, and director of Barts Cancer Centre in London, focus on the latest developments in GU oncology.

So far, they have interviewed five GU oncologists about their early work and contributions to the field: Nick Vogelzang, Maha Hussain, Dean Bajorin, Phil Kantoff, and Larry Einhorn.

The Uromigos "Legends of GU Oncology" series is part of a growing number of podcasts focusing on cancer history, which also includes ASCO's *Your Stories: Conquering Cancer*, and Cancer History Project editorial board member Daniel F. Hayes' series on the *Journal of Clinical Oncology's Cancer Stories*.



Early NCI signage, c. 1940

Spotlight article

Video: Norman D. Sharpless Calabresi Lecture, Nov. 2, 2021
By Yale | Nov. 5, 2021

Sharpless: Today in our age of rapid progress and technical and medical advances, it may be easy to discount the importance of the National Cancer Act. But as 1776 was our nation's history, and 1969 was the Apollo program that put a human on the moon, 1971 really marks the modern era of cancer research. Maybe this comparison strikes you as a little bit over the top, but I do not believe that is so. Ending cancer as we know it will be as big of a deal for humanity as landing someone on the moon.

1971 is really what got us started. That's why this anniversary is so important. It was signed into law at a time of great need for those people who feared cancer so much, which at the time was basically everyone. The NCA's first 50 years was the work of people like Mary Lasker, optimistic politicians, and pioneering oncologists and researchers who were visionary, as I said, but also naïve, as I said.

Quote of the week

“There is no mention of eradicating all cancer. Based on what we know about human biology today, we don’t believe that’s possible at the NCI, at least any time soon. But, we do think we can dramatically change the experience of cancer—that is, the tragedy of cancer, the way the American public knows cancer today.”

– Ned Sharpless

Lung cancer and tobacco control

- The National Cancer Act’s Effect on Tobacco Control: Success Endures, Challenges Remain
  By ASCO | Nov. 3, 2021
- National Cancer Act and Lung Cancer Screening: An Example of Intended Impact
  By ASCO | Nov. 2, 2021
- Decades-long partnership addresses tobacco use in African Americans
  By The University of Kansas Cancer Center | Nov. 1, 2021

Recent contributions

- ATLAS continues pushing the envelope of surgical excellence while enhancing patient safety
  By Roswell Park Comprehensive Cancer Center | Nov. 3, 2021
- Creating the Modern Cancer Center
  By Fox Chase Cancer Center | Nov. 2, 2021

This column features the latest posts to the Cancer History Project by our growing list of contributors.

The Cancer History Project is a free, web-based, collaborative resource intended to mark the 50th anniversary of the National Cancer Act and designed to continue in perpetuity. The objective is to assemble a robust collection of historical documents and make them freely available.

Access to the Cancer History Project is open to the public at CancerHistoryProject.com. You can also follow us on Twitter at @CancerHistProj.

Is your institution a contributor to the Cancer History Project? Eligible institutions include cancer centers, advocacy groups, professional societies, pharmaceutical companies, and key organizations in oncology.

To apply to become a contributor, please contact admin@cancerhistoryproject.com.

IN BRIEF

Blanton Tolbert named Case Comprehensive Cancer Center's first associate director for DEI

Blanton S. Tolbert was named the first associate director for diversity, equity, and inclusion for the Case Comprehensive Cancer Center, complementing his recent appointment as vice dean for diversity, equity, and inclusive excellence for the Case Western Reserve School of Medicine.

As associate director, Tolbert will focus on the following areas:

- With cancer center leadership, supporting research projects that address health disparities and include underserved populations and building research teams that reflect the population served by the center.
- With the associate director for training and education, establishing mentorship programs that ensure the diversification of the future workforce and fostering an equitable training environment.
- With the director and deputy directors, addressing bias and discrimination and integrating diversity, equity, and inclusion into the core activities of the Cancer Center, including recruitment, research development, management, and communications.
- With the associate director for community, outreach, and education, working with individuals, groups, and organizations to better understand the obstacles faced by the population at large.

Tolbert, who has been faculty at Case Western Reserve since 2012 and a full professor since 2019, served as principal investigator of a National Science Foundation-funded Research Experiences for Undergraduates program in chemistry, and was the recipient of several NIH Diversity Supplements.

Tolbert received the Morton L. Mandel Award for Excellence in Research and Service in 2016 from the Department of Chemistry, and was a University Center for Innovation in Teaching and Education Mentors Fellow in 2012. He was appointed the Rudolph and Susan Rense Professor of Chemistry in 2021.

Tolbert is a member of the Case Comprehensive Cancer Center and the Center for RNA Science and Therapeutics. His research group aims to understand the basic mechanisms through which RNA and related retroviruses usurp cellular proteins to regulate gene expression.

Tolbert is the principal investigator on several NIH grants, including the Nuclear Gene Expression Project of the U54 Center for HIV RNA Studies. In 2021, he was appointed chairperson of the NIH Office of AIDS Research Advisory Council.

He chaired the OARAC Strategies to Support, Retain, and Expand the Pool of Early Stage Investigators panel discussion on May 5, 2021. He is also a member of the NIH HVCD study section and the Burroughs Wellcome Fund Postdoctoral Enrichment Program advisory board. He is on the editorial boards of the *Journal of Biological Chemistry* and *Microbiology and Molecular Biology Reviews*.

Case receives NCI merit extension

The Case Comprehensive Cancer Center earned an additional $12 million from NCI as a two-year merit-based extension. The center was the first of two NCI-designated comprehensive cancer centers to be awarded this distinction, followed by Lurie Cancer Center.

The center's Cancer Center Support Grant was last renewed in 2017, when it received an "exceptional" rating along with $27.9 million to support research from 2018-2023.

Since its founding in 1987 by Case Western Reserve and University Hospitals, the center has held an NCI designation;

it attained "comprehensive" status in 1998. Cleveland Clinic formally joined the consortium in 2003.

Fidel Valea appointed to leadership roles in gynecologic oncology at Northwell Health

Fidel A. Valea was appointed system chief of gynecologic oncology at Northwell Health and director of gynecologic oncology at the Northwell Health Cancer Institute. In these roles, he will see patients in New Hyde Park and Manhattan.

Valea is joining Northwell from the Virginia Tech Carilion School of Medicine, where he was chair of obstetrics and gynecology for five years. Prior to that, Valea held several leadership roles during his 12-year tenure at Duke University School of Medicine, including vice chair of education, residency program director in obstetrics and gynecology, fellowship director in gynecologic oncology, and tenured professor.

In his role as system chief of gynecologic oncology at Northwell Health, Valea will direct gynecologic oncology programs across the health system. Key areas of responsibility include: advancing a patient-centered approach to care, overseeing performance improvement and quality assurance studies, enhancing operational efficiencies, developing educational and academic offerings for the fellowship program and other clinical staff, and expanding gynecologic oncology research efforts.

As director of gynecologic oncology at the Northwell Health Cancer Institute, Valea will direct the development of the gynecologic oncology program throughout the health system's central region, working with Northwell's Division of Gynecologic Oncology.

Valea recently completed his tenure as director of Gynecologic Oncology for the American Board of Obstetrics and Gynecology and served on its board. He is one of four editors of *Comprehensive Gynecology*. Valea's research interests are in pre-invasive disease of the cervix, minimally invasive surgery, and evidence-based perioperative care.

SU2C establishes $3.25M head and neck cancer research team

Stand Up To Cancer announced the Stand Up To Cancer–Fanconi Anemia Research Fund–Farrah Fawcett Foundation Head and Neck Cancer Research Team, which will focus on new approaches to address head and neck squamous cell carcinoma, with an emphasis on cancers related to the human papillomavirus and Fanconi anemia.

The team has been awarded $3.25 million over three years to advance therapies, support new approaches, and improve patient outcomes for head and neck cancers. The team will receive $1.5 million each from the Fanconi Anemia Research Fund and the Farrah Fawcett Foundation. The American Head and Neck Society and the Head and Neck Cancer Alliance also each provided $125,000 in support.

Agata Smogorzewska, associate professor at The Rockefeller University, will lead the research team and Barbara Burtness, professor of medicine, interim associate director for diversity, equity and inclusion and co-leader, Developmental Therapeutics Program at Yale Cancer Center and Smilow Cancer Hospital, will serve as co-leader.

Benjamin Young named program manager at the Marvin & Concetta Greenberg Pancreatic Cancer Institute

Benjamin A. Young was named program manager at the Marvin & Concetta Greenberg Pancreatic Cancer Institute at Fox Chase Cancer Center, where he will work with researchers to coordinate the institute's basic, clinical, and population sciences research programs.

Young's primary responsibilities will include ensuring that clinical trials are

conducted efficiently, acting as a liaison between basic and clinical researchers, and maintaining institute policies.

Before taking on this new role, Young was regulatory affairs lead at Fox Chase's Office of Clinical Research. Prior to coming to Fox Chase, Young worked at the American Association for Cancer Research.

Baptist Health partners with ALA in 'Saved By the Scan' campaign

Baptist Health South Florida and the American Lung Association have partnered to raise awareness for lung cancer screenings through "Saved by the Scan," a public service advertising campaign aimed at educating Americans about the low-dose CT scan available to those at high risk for the disease.

The low-dose CT scan can detect lung cancer in its early stages, before symptoms arise, when the disease is more curable.

In 2014, Mark Dylewski, chief of general thoracic surgery at Baptist Health, and Juan Batlle, chief of thoracic imaging at Baptist Health, launched Baptist Health's lung cancer screening program with the support of Dennis Bookshester.

Screening is available throughout Baptist Health. For eligible patients, Medicare and most private insurance companies cover the screening cost.

The South Florida "Saved by the Scan" comprehensive public awareness campaign includes a video public service announcement, digital and print advertisements, and social media.

Mount Sinai Health System and BronxCare Health System open cancer facility

Mount Sinai Health System and BronxCare Health System have launched BronxCare Mount Sinai Comprehensive Cancer Care—a new comprehensive cancer facility in the Bronx.

The 10,000 square foot space houses medical oncology, surgical oncology, and support services, and an expanded treatment area with dedicated chemotherapy and immunotherapy infusion suites.

Kevin R. Jain, section chief of medical oncology and hematology at BronxCare Health System, will direct the center.

The facility's staff includes five medical oncologists and hematologists, five general surgeons, two surgical oncologists, two thoracic surgeons, two radiation oncologists, two neurosurgeons, four urologists, one social worker, two oncology-specialized ENT surgeons, an oncology-certified nursing team, two board-certified oncology pharmacists, an oncology pharmacy residency training program, and a team of administrative and support staff.

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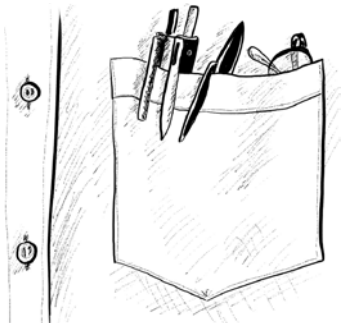
THE CLINICAL CANCER LETTER



TRIALS & TRIBULATIONS

No longer "experimental"—Prostate cancer patients should have access to proton therapy

By Shaakir Hasan, DO
Radiation Oncologist,
New York Proton Center

Proton therapy is an ultra-precise form of radiation that spares patients excess radiation to the heathy tissues and organs surrounding their tumor.

It has been shown to be effective in reducing short- and long-term side effects and improving health outcomes for adults and children with a wide range of cancer types. It is particularly effective in treating tumors near sensitive organs, which is why it's recommended for certain prostate cancer patients.

Despite prospective evidence with over a decade of follow-up demonstrating its safety and efficacy, proton therapy up until recently has been designated "experimental," which makes it less likely for some payers to cover the treatment for patients, restricting access to the very important treatment option.

A new consensus statement from the Particle Therapy Co-Operative Group (PTCOG) may broaden the use of proton therapy to treat prostate cancer, which might improve patient outcomes and quality of life.

In the article *Consensus Statement on Proton Therapy for Prostate Cancer*, which analyzes the decades of data we have on proton therapy, the researchers demonstrate why proton therapy should no longer be considered an "experimental" treatment for prostate cancer.

This report is significant because it is the first time a group of genitourinary oncology experts have come together and gone on record officially stating that the body of academic research supporting the efficacy of proton therapy for prostate cancer has reached a point of critical mass. It is not correct to refer to proton therapy as "experimental" for a condition we know it treats highly successfully.

This statement is a line in the sand for the industry; hopefully it can help us move the conversation forward with patients, providers, and payers in a productive way that makes proton therapy more widely available for appropriate patients.

The PTCOG report is a good start, but governing bodies must join the PTCOG Genitourinary Subcommittee in changing their designation for the use of proton therapy for prostate cancer. In addition to the three-plus decades of existing research, even stronger data are on the way.

We know proton therapy is an effective treatment for prostate cancer, but the real question is can it deliver better results than conventional radiotherapy?

Randomized evidence in other disease sites report reduced side-effects with protons compared with traditional radiation therapy, leading to improved quality of life with proton therapy, but those metrics are complicated to measure and require more dedicated and detailed studies to make definitive claims about superior efficacy.

Thankfully, there is an ongoing, randomized study conducted in partnership by 55 cancer centers across the country that should give us a better understanding of the efficacy of proton therapy when directly compared with traditional photon radiotherapy.

We hope that studies like this will provide the evidence to satisfy the stringent requirements of certain payers and even some providers who, despite the existing evidence of high efficacy and low rates of toxicities, are unsure of the benefit of proton therapy for patients with prostate cancer.

These types of studies analyze important factors with granular data, and not just the subjective physician-reported toxicities, but also patient-reported quality of life metrics.

Prior studies using such metrics have suggested a benefit to bowel function and reduction in toxicities with proton therapy compared with traditional radiation therapy, and future studies will help further determine which patient population could benefit the most from protons.

The good news is proton therapy is getting less expensive. With few side effects, proton therapy can often be delivered in fewer treatments than has historically been delivered with traditional radiation therapy. Furthermore, the costs of building proton therapy centers has continued to decline over time.

As the cost of proton therapy gets closer to traditional photon radiation, as the equipment, technique and processes improve proton therapy outcomes, and as additional long-term data are published showing the benefits of proton therapy over traditional photon therapy, there is a lot of excitement and many indicators that proton therapy access will continue to broaden.

Our team at the New York Proton Center is working with cancer centers across the country to help patients and deliver clinical results that will help determine the important role proton therapy plays in the prostate cancer landscape.

But in the meantime, it is really important to shine a light on the new PTCOG consensus statement to keep the momentum going in the direction of furthering the role of proton therapy for patients.

> “It is not correct to refer to proton therapy as “experimental” for a condition we know it treats highly successfully.”

CLINICAL ROUNDUP

Roswell Park researchers find β-AR stress pathway fuels tumor growth

A team from Roswell Park Comprehensive Cancer Center has identified the beta-adrenergic receptor (β-AR) as a driver of immune suppression and cancer growth in response to chronic stress, opening the possibility of targeting this receptor in cancer therapy and prevention.

The study, titled "β-2-adrenergic receptor signaling regulates metabolic pathways critical to myeloid-derived suppressor cell function within the TME," was published in *Cell Reports*.

Using a preclinical model of triple-negative breast cancer, a research team led by Hemn Mohammadpour, a postdoctoral research affiliate in the lab of Elizabeth Repasky, and Repasky, who is co-leader of the Cell Stress and Biophysical Therapies Program and the Dr. William Huebsch Professor in Immunology at Roswell Park, found that as tumors grow, they become more sensitive to stress signals coming from the nervous system.

Specifically, the researchers discovered that myeloid derived suppressor cells show an increase in the expression of β-AR. The findings will help researchers better understand why prolonged exposure to stress often makes the immune system less effective.

Several clinical trials are planned or underway to investigate which interventions are most effective at mitigating the effects of stress in patients with cancer. Roswell Park is currently studying the effects of combining the β-AR blocker propranolol, which is traditionally used to treat migraines and heart problems, with immunotherapy.

Co-authors include Philip McCarthy, professor of oncology and internal medicine and director of Roswell Park's Transplant & Cellular Therapy Center; Scott Abrams, co-leader of Roswell Park's Tumor Immunology and Immunotherapy Program; and Cameron MacDonald, a predoctoral trainee in immunology.

University of Utah study finds risk of age-related diseases may be higher in younger B-NHL survivors

University of Utah researchers found that younger B-cell non-Hodgkin lymphoma (B-NHL) survivors had a higher relative risk of developing age-related diseases than older B-NHL survivors five years or more after cancer diagnosis.

These results were published in *Cancer Epidemiology, Biomarkers & Prevention*.

Mia Hashibe, professor in the Department of Family and Preventive Medicine at the University of Utah, director of research and practice for the Division of Public Health, and a Huntsman Cancer Institute investigator, was the study senior author. Krista Ocier, a postdoctoral researcher in the Hashibe lab, was the first author.

The authors previously established that younger NHL survivors have higher relative risk of specific heart and artery diseases than their older counterparts. In the present study, they evaluated the long-term risk of respiratory, renal, and other diseases related to aging among younger versus older NHL survivors.

The study included data from 2,129 B-NHL survivors from the Utah Cancer Registry diagnosed between 1997 and 2015. Using the Utah Population Database, the authors matched up to five cancer-free individuals from the general population (8,969 individuals in total) with each B-NHL survivor based on sex, age, and state of birth.

They identified age-related disease outcomes through medical records from Intermountain Healthcare and the University of Utah, along with statewide health care facility data, and estimated the relative risk of these outcomes for younger and older B-NHL survivors (diagnosed at less than 65 years of age or more than 65 years of age, respectively) at least five years after cancer diagnosis.

Relative risks of acute renal failure, pneumonia, and nutritional deficiency were higher among younger than older NHL survivors compared with their respective general population cohorts. Compared with the general population, the risk of acute renal failure was increased 2.24-fold in younger survivors and 1.13-fold in older survivors; the risk of pneumonia was increased 2.42-fold in younger survivors and 1.44-fold in

older survivors; and the risk of nutritional deficiencies was increased 2.08-fold in younger survivors and 1.25-fold in older survivors.

The researchers did not observe risk differences for other age-related diseases such as chronic kidney disease and osteoporosis between younger and older survivors, although NHL survivors have an overall elevated risk of these diseases.

ALA survey identifies gaps in lung cancer awareness

The American Lung Association's LUNG FORCE initiative released the 2021 Lung Health Barometer, a national survey that examines awareness, attitudes, and beliefs about lung health and lung cancer. This is the sixth year the survey has been conducted.

The 2021 Lung Health Barometer surveyed 4,000 Americans nationwide about lung health and lung cancer. Some key findings include:

- 29% of Americans know that lung cancer is the leading cancer killer of women and men, an 8% increase from the 2020 Lung Health Barometer.
- 10% of adults understand that lung cancer is among the most likely cancers to affect women while 35% know that it is among those likely to affect men.
- 36% of respondents know that lung cancer screening is now available for early detection of the disease.

More results from the Lung Health Barometer survey can be found here.

Johns Hopkins Medicine study shows copper + disulfiram effective in childhood medulloblastoma

Researchers at Johns Hopkins Medicine and Italy's Catholic University of the Sacred Heart medical school have shown that copper ions combined with disulfiram (DSF), a drug used for nearly 70 years as a treatment for alcoholism, may help kill and prevent the growth of medulloblastoma cancer cells in children.

The prospective therapy is described in a Johns Hopkins-led study published in *PLOS ONE*.

Led by Riccardo Serra, a postdoctoral fellow at JHU and a neurosurgery resident at the University of Maryland, researchers tested the anticancer activity of DSF-Cu++ and attempted to define what it targeted at the molecular level to achieve these effects—both in cell cultures and mice.

The researchers found that DSF-Cu++ blocks two biological pathways in medulloblastomas that the cancer cells need to remove proteins threatening their survival. They also discovered that DSF-Cu++ not only kills medulloblastoma cells, but also curtails tumorigenesis.

A third finding from the study revealed that DSF-CU++ impairs the ability of medulloblastoma cells to repair damage to their DNA, thereby enhancing the cytotoxic power of the treatment.

Finally, the researchers tested the impact that combining DSF and copper had on survival rates of mice whose brains were implanted with two subtypes of medulloblastoma. Significant increases in prolonging survival days (19% and 27%) were seen.

DRUGS & TARGETS

Scemblix receives FDA approval for Ph+ CML

FDA granted accelerated approval to Scemblix (asciminib) for patients with Philadelphia chromosome-positive chronic myeloid leukemia (Ph+ CML) in chronic phase, who were previously treated with two or more tyrosine kinase inhibitors. FDA also approved Scemblix for adult patients with Ph+ CML in CP with the T315I mutation.

Scemblix is sponsored by Novartis.

ASCEMBL (NCT03106779), a multi-center, randomized, active-controlled, open-label clinical trial, is evaluating Scemblix in patients with Ph+ CML in CP, previously treated with two or more TKIs. A total of 233 patients were randomized (2:1) and stratified according to major cytogenetic response status to receive either Scemblix 40 mg twice daily or Bosulif (bosutinib) 500 mg once daily.

Patients continued treatment until unacceptable toxicity or treatment failure occurred. The main efficacy outcome measure was major molecular response at 24 weeks. The MMR rate was 25% (95% CI: 19, 33) in patients treated with Scemblix compared with 13% (95% CI:

6.5, 23; p=0.029) in those receiving Bosulif. With a median duration of follow-up of 20 months, the median duration of MMR has not yet been reached.

CABL001X2101 (NCT02081378), a multi-center, open-label clinical trial, is evaluating Scemblix in patients with Ph+ CML in CP with the T315I mutation. Efficacy was based on 45 patients with the T315I mutation who received Scemblix 200 mg twice daily.

Patients continued treatment until unacceptable toxicity or treatment failure occurred. The main efficacy outcome measure was MMR, which was achieved by 24 weeks in 42% (19/45, 95% CI: 28% to 58%) of the patients and by 96 weeks in 49% (22/45, 95% CI: 34% to 64%) of the patients. The median duration of treatment was 108 weeks (range, 2 to 215 weeks).

FDA approved this application four months ahead of the FDA goal date. This application was granted priority review, breakthrough designations, fast track designation, and orphan drug designation.

NCI TRIALS

NCI Trials for Nov. 2021

The National Cancer Institute Cancer Therapy Evaluation Program approved the following clinical research studies last month.

For further information, contact the principal investigator listed.

Phase I - 10483
Phase Ib Trial of Erdafitinib Combined with Enfortumab Vedotin Following Platinum and PD1/L1 Inhibitors for Metastatic Urothelial Carcinoma with FGFR2/3 Genetic Alterations

University Health Network, Princess Margaret Cancer Center LAO
Jain, Rohit
(813) 745-8958

Phase II - A032002
Phase II Randomized Trial of Atezolizumab Versus Atezolizumab and Radiation Therapy for Platinum Ineligible/Refractory Metastatic Urothelial Cancer (ART)

Alliance for Clinical Trials in Oncology
Nagar, Himanshu
(212) 746-3600

Phase II - S2104
Randomized Phase II Trial of Postoperative Adjuvant Capecitabine and Temozolomide Versus Observation in High-Risk Pancreatic Neuroendocrine Tumors

SWOG
Soares, Heloisa Prado
(801) 585-9682

Phase II/III - NRG-HN009
Randomized Phase II/III Trial of Radiation with High-Dose Cisplatin (100 mg/m2) Every Three Weeks Versus Radiation with Low-Dose Weekly Cisplatin (40 mg/m2) for Patients with Locoregionally Advanced Squamous Cell Carcinoma of the Head and Neck (SCCHN)

NRG Oncology
Harari, Paul Maurice
(608) 263-8500

Phase III - NRG-GU010
Parallel Phase III Randomized Trials of Genomic-Risk Stratified Unfavorable Intermediate Risk Prostate Cancer: De-Intensification And Intensification Clinical Trial Evaluation (GUIDANCE)

NRG Oncology
Desai, Neil B.
(214) 645-8585