Advancing Patient Care Through Focused Innovation

NCI director Norman Sharpless shares his vision at American Association for Cancer Research annual meeting.

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From the moment I became NCI director, I've been asked whether I have a new vision for NCI. My response has been that I'm holding off on any announcement of that kind until I've taken 6 months to do a thorough "listening and learning tour," so that I could really get to know NCI in its full complexity and its role in and impact on the cancer research community.

Now that the 6 months have passed, I can say that this process has been valuable. What I heard from patients, scientists, advocates, and clinicians during this time has been extremely enlightening and has helped inform my thinking about how to shape the direction of NCI and the cancer research enterprise.

Earlier today, at the 2018 American Association for Cancer Research (AACR) annual meeting, I had the opportunity to describe my vision of what I see as the key focus areas for NCI, and I'd like to share those same thoughts with the rest of the cancer community.

Developing Innovative Approaches to Cancer Research

During the process of identifying these critical areas of focus, I kept a few overarching principles in mind.

First, as we continue to identify and assemble the pieces of the cancer puzzle, what has emerged is the recognition that cancer is not one disease but, in fact, hundreds—maybe even thousands—of clinically distinct cancer types. This understanding is central to improving how we approach studying cancer and developing new ways to prevent and treat it.

Take lung cancer, for example. At one time, we thought of it as simply that: lung cancer. Then we identified a subtype called non-small cell lung cancer. Later we discovered the further subtype of RAS mutant non-small cell lung adenocarcinoma. And then, just in the last few years, this subtype has been further segmented into RAS mutant non-small cell lung adenocarcinoma with low tumor mutational burden (or PD-L1 expression), and so on.

This same refinement into molecularly distinct cancers is occurring for every type of cancer and has important implications in all aspects of cancer care and research, including epidemiology, prevention, screening, and treatment.

Of course, we also need to remain aware that cancer is not merely "a tumor encased in a human" but rather a problem of a unique individual. Therefore, we must further consider patient-specific factors, as well—such as race, ethnicity, and sociobehavioral characteristics—which also have an impact on a patient's prognosis, treatment choices, and long-term needs.

A second guiding principle for me is that we owe it to patients to make progress against all cancers, not just the more common or easier-to-manage types. This becomes a very important idea when you consider the tremendous and ever-growing heterogeneity of cancer. Given NCI's unique position, we can take the lead in bringing greater research attention to all types of cancer, including the most intractable diseases. We must not be afraid to fail.

A third principle is that the staggering heterogeneity of cancer demands new approaches, new understanding of the molecular and cellular biology of cancer, new ways of conducting clinical trials, scientists with different training, and new ways of harnessing data. We have made tremendous progress, and, where things have worked, we should keep going full steam ahead. But where progress has lagged, we must put innovative thinking into action.

NCI Key Focus Areas

These guiding principles have led me to identify four areas of opportunity that, with enhanced attention from NCI, I believe are particularly important for accelerating progress in cancer research and care.

To be sure, these are not new areas for NCI. However, I believe the time is ripe for a laser-sharp focus on these four areas, based on where we are today in terms of scientific and technological trends. If we are to make the most of these opportunities, it's incumbent on NCI to be innovative in its approach to cancer research.

The future is here and the time is now. If we don't shift our focus to these areas, we risk missing critical opportunities for achieving rapid and meaningful progress.

The first focus area is training and development of the workforce—the people doing the science and providing the care. One of NCI's most important responsibilities is ensuring the long-term success of the cancer research enterprise by attracting, training, and retaining the best and brightest minds from diverse backgrounds—from the budding high school student to the seasoned researcher.

Through enhanced workforce training and development, we can help researchers develop the necessary skills—training in immunology, for example, because, as we're discovering, the immune system is so important in terms of cancer treatment. Proficiency in data science to fully understand how to work with big data is another skill set that is clearly a necessity for being a

successful scientist today and in the future. A third example is competency in the statistical and population sciences methodologies needed to make progress against the complex issues of cancer health disparities. Our progress in cancer depends on having a workforce ready to tackle the accelerating pace of discovery.

A second area of focus is a renewed commitment to basic science. It's akin to the preparation referred to in a quote I like that is often attributed to Abraham Lincoln: "Give me 6 hours to chop down a tree and I will spend the first 4 sharpening my axe." I believe we must sharpen our axes and maintain a committed focus on fundamental science, because it is the foundation upon which every other kind of cancer research is built.

There is still very much about cancer that remains unknown. Indeed, we don't even know how much there is that we don't know—it's that elusive realm of unknown unknowns. Yes, we have made tremendous progress on some cancers, but there are others for which progress has been glaringly absent. By invigorating our commitment to basic science—with an eye toward bottom-up, investigator-initiated research—we can continue to deepen our understanding of the biology of cancer and perhaps finally make advances against those cancers that have been resistant to progress.

The third area we will focus on is catalyzing big data technology to better inform cancer research. To fully realize the incredible promise of precision oncology, data collection and reporting must be done with intentional standardization.

Without this, it will be impossible to aggregate and truly take advantage of the complex datasets being generated to help us improve cancer outcomes and care in the real world. We must also employ more sophisticated tools for data analysis including machine learning and exoscale computation to understand the larger, complex projects we are producing through the aggregation of multimodality datasets. A key part of success in this area will be training young scientists with expertise in data science, as well as attracting data scientists from other fields into cancer research.

If we are to transform today's research into tomorrow's groundbreaking clinical discoveries, a focus must be on shifting from passive data sharing to active data aggregation on a much broader scale. By aggregating different types of data from large samples of patients—for example, linking genomic, pathology, radiology, and clinical data—critical relationships between cancer type and treatment may become apparent that otherwise would not emerge from traditional analyses.

A harmonized approach to big data will allow us to learn from every patient—those we have successfully treated, as well as those we have failed to help. All patients have valuable experiences that can shed light on cancer research.

The fourth area of key focus is clinical trials. Clinical trials are the fundamental means for making progress in cancer treatment and prevention, but we need a shift in how we think about and design clinical trials to make them work better for researchers, clinicians, and patients.

These changes must address such challenges as cancer heterogeneity, poor accrual rates, the difficulty patients have in finding trials, unnecessary exclusion criteria, and onerous costs. In short, we need to modernize clinical trials, moving towards smaller, more focused, more rapid trials that can often be deployed in a community setting.

Clearly, there is much more to say about each of these four focus areas and their interrelationships, and in the weeks and months ahead I plan to expand upon them in blogs, interviews, and other forums.

At the same time, I want to make it very clear that focus on these areas does not mean that other areas not explicitly mentioned here will be neglected. NCI is responsible for the entire National Cancer Program, for research and progress that spans the entire research continuum from prevention, detection, and diagnosis, to treatment and survivorship.

We owe it to our patients to remain committed to our mission and to work together to lessen the awful burden of cancer.

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