The Cancer Moonshot Initiative: Current and Future Cancer Research Objectives

The Cancer Moonshot initiative is bringing together scientists, oncologists, patient advocates, and representatives of the biopharmaceutical industry with renewed collaborative focus and the ambitious objective of achieving ten years of cancer research progress in five years.

On October 27, 2016, the Cancer Moonshot Blue Ribbon Panel released its report that represented the biomedical science, technology, advocacy, social science, and big data coming together to solve cancer's greatest challenges. A bipartisan Congress authorized $1.8 billion in funding over seven years for the initiative as part of the 21st Century Cures Act, and appropriated the first $300 million in fiscal year 2017. The National Cancer Institute has announced the first series of research projects to be conducted through the Beau Biden Cancer Moonshot program.

For a congressional briefing held on October 4, 2017, the National Coalition for Cancer Research brought together a panel of experts to discuss the progress made during the first year of the program, as well as current and future objectives of this unprecedented collaborative effort.

Richard Schilsky, M.D., FACP, FASCO, Senior Vice President and Chief Medical Officer, American Society of Clinical Oncology

The panel's moderator **Dr. Richard Schilsky of the American Society of Clinical Oncology** cited a recent report from the American Cancer Society demonstrating that breast cancer mortality has declined 40% in the past 25 years. "What's even more remarkable is that it's not unique to breast cancer. All cancer mortality has been declining for at least the last two decades by 1-2% per year." Dr. Schilsky noted that this progress is accompanied by longer survivorship and many more people living successfully with cancer, which has resulted in tens of millions of cancer survivors around the world. "Today someone diagnosed with cancer has better than a two-thirds chance of being alive five years from now." He indicated that we now have more cancer drugs being introduced into clinical practice more quickly than ever before, and there are times when there might be two or three new cancer drug approvals by the Food and Drug Administration for cancer therapies or new cancer drug indications within the same week. "Times are changing at a breathtaking pace in cancer and generally all for the better." Dr. Schilsky stressed that while there has been considerable progress, "we have not solved the cancer problem – cancer will continue to be with us for many years to come. The number of new cancer cases predicted to be diagnosed in the United States will continue to grow largely due to the expansion and aging of our population." Additionally, he indicated that we still have significant cancer health disparities in this country and not all of the benefits that are available to some patients are available to all patients.

Dr. Schilsky underscored that all of the progress that has been made against cancer is ultimately a result of basic cancer research that is funded in large part by the National Institutes of Health (NIH) and National Cancer Institute (NCI). "There is almost no advance that one can't find a link back to a

scientist with a NIH grant. It is that sustained investment in biomedical research that has fueled all of the progress that we have seen up until now and that we hope to see continuing into the future." He highlighted that the support from members of Congress is critical to continue to accelerate the pace of progress. "The goal of the Beau Biden Moonshot was to make ten years of progress in five years, which is an incredible initiative. Sometimes progress against cancer is slow and incremental, and doubling the rate of progress is a big challenge," he emphasized.

Douglas R. Lowy, M.D., Acting Director, National Cancer Institute

"Although we have made a great deal of progress, cancer remains an incredible scourge," remarked **Dr. Douglas Lowy, Director of the National Cancer Institute**. He pointed out that that 600,000 people still die of cancer, which is equivalent to the number of deaths on September 11, 2001 every two years. Additionally, he highlighted that the cause of death of one out of four Americans is cancer. "Cancer is going to be with us for a long time to come, but we are hoping that in the future we will be able to continue to control things so that the 600,000 people go down progressively and by the end of 30 years we have cut that number at least in half." Dr. Lowy cited two main ways in which he believes we can cut the number of cancer deaths by half - decrease the number of people who get cancer and 2. Improve cancer patients' outlooks and their quality of life. He referred to these as the "twin pillars" of how the NCI is trying to help patients.

Dr. Lowy provided an overview of the Cancer Moonshot and its priorities. He explained that the Moonshot is not focused on all areas of cancer research but instead concentrates specifically on a group of ten recommendations that were felt to be rich for advancement. In FY17, the NCI funded six of those ten areas and plans to fund research in the remaining four areas during FY18Dr. Lowy acknowledged two specific areas where the NCI is now using Moonshot funding to pursue new opportunities. The first area is childhood cancer research, specifically related to driver fusion oncoprotiens (rearranged genes that play a particular role in children with cancer), and in harnessing the power of immunotherapy as a treatment approach for children with cancer. The second area is data sharing – big data - using genomics and proteomics and making this data available to the entire scientific community.

Finally, Dr. Lowy highlighted the importance of support for scientific research and the regular appropriation for NIH and NCI. Since the goal of the Cancer Moonshot is to accomplish in five years what ordinarily would take ten years, there are many areas of the regular appropriation not covered by the Cancer Moonshot. He emphasized the significance of support for training the next generation of researchers and basic research conducted by investigators at NCI-designated cancer centers. "The vast majority of our advances are thanks to basic research and investigator-initiated research – these are our major engines of discovery," he mentioned. "We are extraordinarily fortunate that biomedical research has been strongly supported in a bipartisan way and continues to be supported that way. The Cancer Moonshot is amazing funding for us, but it is an augmentation and what's being recommended is really because of the long-term support for the NIH and NCI and other biomedical research funding." "

Peter J. O'Dwyer, M.D., Director, Developmental Therapeutics Program, Abramson Cancer Center, Hospital of the University of Philadelphia; Professor of Medicine, Hospital of the University of Pennsylvania, Presbyterian Medical Center of Philadelphia

As a member of the Cancer Moonshot Clinical Trials Working Group, **Dr. Peter O'Dwyer of the Abramson Cancer Center** provided his reflections on the panel's deliberations in creating recommendations to solve cancer's greatest challenges. He explained that the Blue Ribbon Panel was diversified in terms of discipline and comprised of clinical researchers, biostatisticians, scientists, patients, and advocates. "Everybody had a role and everybody had a voice. The resulting projects were influenced by all of the participants in the process." He emphasized that the goal of ten years of progress in five years required "big ideas that would have an immediate impact."

One of the projects that he and his colleagues proposed involving the application of bioinformatics to tumor specimens was approved. Dr. O'Dwyer stated this particular project focused on colorectal cancer as a model but was applicable to many other cancer types. He explained this project "was a huge opportunity for us to make an advance based on work that had already been done." "There has been 50 years of funding and resources devoted to improving the lot of cancer patients, and in those 50 years many clinical trials have been done, and there were numerous samples available from patients with various diseases where we knew very well what the outcome of their treatment was." He and his colleagues suggested they could create a service for colon cancer patients if they could distinguish the patients who would benefit from adjuvant therapy compared to those who do not need therapy. He explained that finding out who needs treatment "allows us to focus on tumors that are most aggressive, identify at a very basic level what are the drivers of these tumors and then more accurately tailor therapy to these tumors." Most importantly, this concept is pertinent to a large number of other disease sites.

Dr. O'Dwyer underscored that this project was enabled by the fact that there was NCI support for clinical trials over a 30-year period and support for obtaining tissue from the time of surgery on patients that was banked away. He noted that this work could not have been done without the NCI-funded cooperative groups who bring treatments from cancer centers to patients around the country. Additionally, he clarified that the NCI funds research that is either not a priority or a reach too far for the pharmaceutical industry to fund and that NCI-funded cooperative groups are responsible for studying rare tumors, the diversity of accrual, and the application of bioinformatics in large trials. Finally, he explained that developing studies in cooperative groups is very similar to the Moonshot. "We get together - clinical researchers, biostatisticians, scientists together with nurses, clinical research associates, patients, and advocates and develop studies going forward. We hope that all of these will have the same impact as the Moonshot. These are our part of investment in the healthcare system."

Thomas J. Lynch, M.D., Executive Vice President, Chief Scientific Officer, Bristol-Myers Squibb

How does an idea become a cure? **Dr. Thomas Lynch of Bristol-Myers Squibb** suggested these advancements happen because of collaboration across a wide variety of stakeholders. "Ideas that are the seed of the American and global pharmaceutical industry often come from federally funded grants." Once the idea becomes a target, then the pharmaceutical industry takes over. He explained that pharma is really good at taking a target and making something that can interact with that target and figuring how - the drug should be used. "We have fantastic clinical research abilities and the ability to determine which patients will benefit most from our drug." Pharmaceutical companies are also developing an extremely important capability known as translational medicine, which is "the ability to take the experience of one group of patients take it back to the laboratories and take that forward to develop even more drugs." Dr. Lynch stated that this type of research is almost always in collaboration with universities and academic medical centers. "This would not happen if it was just scientists working in an isolated lab nor would it happen if it was just pharmaceutical companies working alone – It only happens because of the ecosystem."

Dr. Lynch emphasized that while we have had great accomplishments against several types of cancer, cancer "remains an enormous threat to the health of the American people." "We have got to invest in basic science. Pharmaceutical companies need targets to develop the next generation of medications that will produce cures years from now." Dr. Lynch underscored the importance of funding basic science at the NIH. He provided explicit instructions to members of Congress and their staff about the need to increase funding for basic science and invest in bioinformatics. "We need to shorten the timeline to develop drugs. Our patients keep telling us they want a sense of urgency in drug development. We need breakthroughs that are going to allow us to understand how to develop drugs faster." He explained this is going to come from data and analytics and bioinformatics, and that this is an

area where the federal government is uniquely able to spur and drive innovation. “The tools that we have in basic science and clinical science to make enormous change and make a difference for people have never been greater than they are today. That’s why the opportunity for us to apply those tools is something we just can’t pass up,” he concluded.

Jacqueline D. Smith, MA, MS, Cancer Survivor, Policy and Advocacy Manager, Society for Immunotherapy of Cancer

A two-time melanoma survivor, **Jacqueline Smith, of the Society for Immunotherapy of Cancer**, shared her personal experience as a cancer patient and clinical trial participant. “I stand here today as a human embodiment of recent advances and progress in clinical research.” When she was first diagnosed with melanoma 15 years ago, the standard of care was “harsh and debilitating.” After being diagnosed with a melanoma recurrence, her physician encouraged her to participate in a clinical trial. She was hesitant because she “didn’t want to be a research specimen and did not want to receive placebo,” but when she was presented with the opportunity to participate in an immunotherapy clinical trial, she accepted. Ms. Smith was the third person enrolled in a pegylated interferon clinical trial in the United States, where she had to self-administer injections weekly for a year. “That was ten years ago,” she remarked. “Prior to the trial, my primary care physician said it would be a miracle if I was here in five years.”

Ms. Smith emphasized that the immunotherapy approach used to treat melanoma as well as other types of cancer today is a product of the research that began 30 years ago at the NIH. She explained that it took at least 20 years for the treatment that she received to move from the lab to being tested for feasibility in humans. “I stand here today because I participated in that trial. A lot of people I knew with my diagnosis are not here to tell their story.” Ms. Smith stressed the importance of making sure that everyone has access to quality healthcare like she did and guaranteeing that similar medical innovations are continually funded. “I would like to see us have a paradigm shift in how we look at clinical research. Clinical research is seen as research with clinical trials and to further drug development. In my case and the case of many other cancer survivors who are here today, clinical research is about saving lives. It is about survival.” Ms. Smith highlighted that NIH funding is critical. “Continuing to fund medical research is not just about helping someone in their career of helping keep this pipeline going, it is also about helping to save and prolong lives.”