The Cancer Moonshot

CSR Advisory Council
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Goals of the Cancer Moonshot

- Accelerate progress in cancer, including prevention & screening
  - From cutting edge basic research to wider uptake of standard of care
- Encourage greater cooperation and collaboration
  - Within and between academia, government, and private sector
- Enhance data sharing

(Presidential Memo 2016)
Blue Ribbon Panel

- “The Blue Ribbon Panel … will provide expert advice on the vision, proposed scientific goals, and implementation of the National Cancer Moonshot. ..The panel may also recommend other cancer research activities to enhance this effort.

- “The Panel will provide an intensive examination of the opportunities and impediments in cancer research…

(Presidential Memo 2016)
Blue Ribbon Panel

- 28 Members
  - Clinicians, researchers, advocates, representatives from pharma and IT
  - Three face-to-face meetings to identify “Moonshot” recommendations

- 7 Working Groups
  - Clinical trials, enhanced data sharing, cancer immunology, tumor evolution, implementation science, pediatric cancer, precision prevention and early detection
  - Each group had 12-15 members. In total, ~150 individuals were actively involved
  - Met weekly for 6 weeks to generate 2-3 recommendations/working group of major scientific opportunities “poised for acceleration”
Scientific and Community Outreach Activities

Goal:

- Provide opportunities for the public and experts ways to submit ideas
- Increase the public’s participation in the Cancer Moonshot

Approaches:

- Online public idea repository – over 1600 ideas submitted
- One-on-one public input: email
- BRP Listening sessions
- Professional conferences

Response:

- Over 1600 ideas received
Overview of Blue Ribbon Panel Report

- The Report summarizes the recommendations of exceptional research opportunities that could lead to powerful advances in our understanding of cancer.

- The online Report includes all recommendations in their entirety at [www.cancer.gov.brp](http://www.cancer.gov.brp)
Blue Ribbon Panel Recommendations

A. Network for direct patient engagement
B. Cancer immunotherapy translational science network
C. Therapeutic target identification to overcome drug resistance
D. Creation of a national cancer data ecosystem
E. Fusion oncoproteins in pediatric cancer
F. Symptom management research
G. Precision prevention and early detection
H. Retrospective analysis of biospecimens from patients treated with standard of care
I. Creation of human tumor atlas
J. Development of new enabling technologies

Cross Cutting Themes: Health disparities, prevention, data sharing, partnerships

www.cancer.gov/brp
Summary of the Recommendations

A. Network for direct patient engagement:
   - Enlist patients in federated network where patients can “pre-register” for clinical trials and contribute their tumor profile data to expand knowledge about what therapies work and in whom.

B. Cancer immunotherapy translation network.
   - Organize a network to discover and evaluate novel immune-based approaches for adult and pediatric cancers, and eventually develop vaccines.

C. Therapeutic target identification to overcome drug resistance.
   - Launch interdisciplinary studies to delineate mechanisms that lead cancer cells to become resistant to previously effective treatments.

D. Creation of a national cancer data ecosystem.
   - Create an ecosystem to collect, share, and interconnect datasets.
Summary of the Recommendations (continued)

E. Fusion oncoproteins in pediatric cancer.
   • Improve understanding of the abnormal fusion proteins that result from chromosomal translocations and drive many pediatric cancers.

F. Symptom management research.
   • Support research to accelerate development of guidelines for management of patient-reported symptoms to improve quality of life and adherence to treatment regimens.

G. Precision prevention and early detection:
   • Implementation of evidence-based approaches. Conduct implementation science research to encourage broader adoption of HPV vaccination, colorectal cancer screening, and tobacco cessation.
Summary of the Recommendations (continued)

H. Retrospective analysis of biospecimens from patients treated with standard of care.
   • Analyze biopsies to learn which features predict outcome to better plan treatment for future patients.

I. Creation of human tumor atlas.
   • Catalog the evolution of genetic lesions and cellular interactions in tumor/immune/other cells in tumor microenvironment from the earliest detected lesions to metastasis and develop predictive models

J. Development of new enabling technologies.
   • Support development of technologies to accelerate testing of therapies and tumor characterization.
Cancer Funding in 21st Century Cures Act

- The cancer research portion is named the Beau Biden Cancer Moonshot Initiative

- $1.8 billion over 7 years
  - $300 million for FY17
  - $300 million for FY18
  - $400 million for FY19
  - ~$200 million FY20-23

- “To support cancer research, such as the development of cancer vaccines, the development of more sensitive diagnostic tests for cancer, immunotherapy and the development of combination therapies, research that has the potential to transform the scientific field that has inherently higher risk, and that seeks to address major challenges associated with cancer.”
Highlights of the 2018 Cancer Moonshot Initiatives

- Pediatric Immunotherapy Discovery and Development Network
- Immuno-Oncology Translation Networks
- Fusion Oncoproteins in Childhood Cancers Consortium
- Drug Resistance and Sensitivity Network
- National Cancer Data Ecosystem
- Symptom Management Research
- Accelerating CRC Screening & Follow-up through Implementation Science (ACCSIS)
- Human Tumor Atlas Network
Recommendation: Develop a pediatric immunotherapy translational network that would facilitate the testing of new immunotherapy approaches in childhood cancers.

Implementation: PI-DDN

PI-DDN Centers and Projects - Advancing translational research of immunotherapy approaches for children and adolescents with cancer:

Awards (6):
- Identification of antigenic epitopes and development of optimized epitope-targeting therapeutic reagents
- Identification and therapeutic targeting of cancer cell-intrinsic and -extrinsic mechanisms of immune evasion in the tumor microenvironment
Recommendation: Accelerate translation of basic discoveries to clinical applications to improve immunotherapy outcomes for both “hot” and “cold” cancers.

Implementation: Leverage the expertise and resources of a collaborative network of investigators focused on improving immunotherapy approaches:

- Investigate the innate and adaptive immune mechanisms contributing to tumor progression or suppression.
- Identify factors contributing to tumor escape from immune surveillance.
- Discover and evaluate new immunotherapy strategies.
- Investigation of intrinsic and extrinsic pathways leading to acquired resistance to immune-modulating regimens.
**Fusion Oncoproteins in Childhood Cancers**

**Recommendation:** Improve our understanding of fusion oncoproteins in pediatric cancer.

**Implementation:** Fusion Oncoproteins in Childhood Cancers (FusOnC2) Consortium

**FusOnC2 Research Centers (U54s)** – Advancing biological research in the area of pediatric fusion oncoproteins and informing the development of targeted therapies for childhood cancers.

- Focus on fusion oncoproteins found in tumors that have a *high-risk* of treatment failure:
  
  A) EWSR1-FLI1/EWSR1 (Ewing sarcoma) (2)
  
  B) SS18-SSX (synovial sarcoma) (2)
  
  C) Fusion-positive rhabdomyosarcoma
    
    Intramural – Barr, Kahn
**Recommendation:** Establish multidisciplinary research teams to determine cancer cell vulnerabilities that can be used for the development of new therapies that prevent or overcome therapeutic resistance.

**Implementation:** DRSN and DiCoCo

- **Drug Resistance and Sensitivity Centers of the DRSN** – preclinical and collaborative studies to understand and combat mechanisms of tumor resistance and/or to exploit tumor sensitivity to anti-cancer therapies.

- **CCR Lymphoma Basket Trial: Divide and Conquer with Combinations (DiCoCo)** - testing combinations of targeted treatments and measuring biomarkers in patients with lymphoma to identify effective combinations of drugs that can treat the disease and overcome drug resistance.
National Cancer Data Ecosystem

**Recommendation:** Build a National Cancer Data Ecosystem for sharing and analyzing data from cancer studies.

**Implementation:** National Cancer Data Ecosystem

- **NCI Cancer Research Data Commons (CRDC)** - Part of a data science infrastructure that connects data collections with analytical tools.
- **NCI Office of Data Sharing**
- **Privacy Preserving Patient Record Linkage Software** – Developing unique patient identifiers that link to individual patient data from different sources.
- **NCI Genomics Evidence Neoplasia Information Exchange (GENIE) Supplements** - Promoting genomic and clinical data sharing.
- **NCI Metadata Annotator** - improved identification and use of high-quality metadata.
- **NCI Imaging Support to the APOLLO Network** - Supporting an APOLLO image library of clinical cancer tissues.
Symptom Management Research

**Recommendation:** Develop guidelines for managing patient-reported symptoms to minimize debilitating side effects of cancer treatment.

**Implementation:** Symptom Management Research Projects

- **Analyzing and Interpreting Clinician and Patient Adverse Event Data to Better Understand Tolerability** - Developing new methods for collecting and analyzing PROs in cancer clinical trials to improve the understanding of harmful side effects.

- **Improving Management of Symptoms Centers (IMPACT)** - Setting up integrated symptom monitoring and management systems in clinics and testing the impact of the systems on patient outcomes.

- **CCR Graft-Versus-Host Disease (GVHD) Symptom Management** – Developing a pediatric chronic symptom scale (PCSS) for GVHD to improve the understanding and management of GVHD symptoms.
Prevention and Screening

**Recommendation:** Conduct implementation research to accelerate the adoption and deployment of sustainable, evidence-based cancer prevention and screening interventions at multiple levels and in different settings.

**Implementation:** Prevention and Screening Research Projects

- **Tobacco Cessation Treatment in Cancer Patients at NCI Cancer Centers**
- **Improving Smoking Cessation in Socioeconomically Disadvantaged Populations via Scalable**
- **CCR Cervical Cancer Control and HPV Vaccine Trials**
- **Accelerating Colorectal Cancer Screening and Follow-up through Implementation Science (ACCSIS)**
- **Dissemination of a Colorectal Cancer Screening Program Across American Indian Communities**
Human Tumor Atlas Network (HTAN)

**Recommendation:** Create dynamic 3D maps of human tumor evolution.

**Implementation:** HTAN

**HTAN** - Constructing 3D atlases of the multidimensional cellular, morphological, molecular features of human cancers over time.

- Focus on high-risk cancers; including those responsive/non-responsive to immunotherapy; pediatric cancers
- Represent a diverse patient population, including minority and underserved patients
- Describe transitions during cancer: pre-malignant lesions to malignancy, locally invasive to metastatic cancer, and the development of therapeutic resistance

**Human Tumor Atlas Research Centers** - Generating organ-specific human tumor atlases.

**PreCancer Atlas Research Centers** – Constructing atlases of precancerous lesions and their microenvironment.

**HTAN Data Coordinating Center** – Ensuring interoperability of HTAN data and dissemination of results to the scientific community

*Figure from A. Regev and HTAPP Team*
Cancer Moonshot FOAs

https://www.cancer.gov/research/key-initiatives/moonshot-cancer-initiative/funding
Questions?

www.cancer.gov/moonshot