Transforming Translation: Harnessing Discovery for Patient & Public Benefit

A Report to the National Cancer Advisory Board from the Translational Research Working Group

June 15, 2007 - Bethesda, Maryland

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NIH Mission Statement

"Science in pursuit of fundamental knowledge about the nature and behavior of living systems

&

the application of that knowledge to extend healthy life and reduce the burdens of illness and disability"

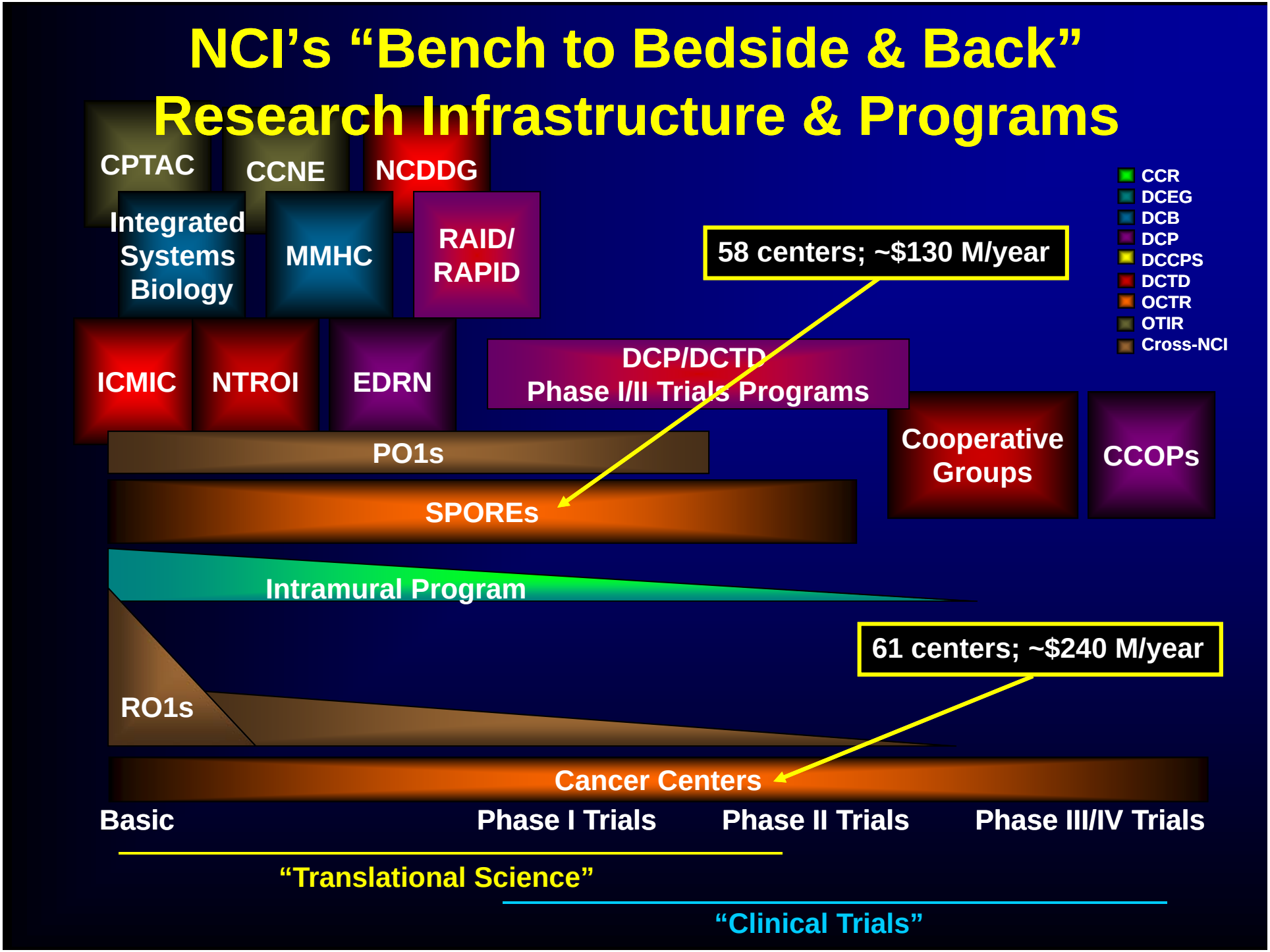
http://www.nih.gov/about/index.html#mission.htm

Translational Research Working Group

Charge:

Evaluate the current status of NCI's investment in translational research & envision its future in an inclusive, representative & transparent manner

NCI's "Bench to Bedside & Back"
Research Infrastructure & Programs

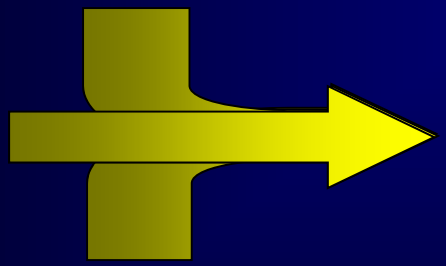


Why Convene a TRWG? Why Now?

Major advances in cancer biology

Changing environment

- Growth
- Diversity
- Competition



Translational systems that cannot keep pace

TRWG's Activities

- Recruited leadership & members
- Reviewed 11 foundational documents
- Analyzed Clinical Trials Working Group process for ideas, challenges & lessons learned
- Developed web-based communication platform *(www.cancer.gov/trwg)*
- Gathered public input on key questions & proposed solutions
  - Public Roundtable I (Phoenix) + web – February 2006
  - Industry/foundation/society Roundtable (Philadelphia) – April 2006
  - Public Roundtable II (Atlanta) + web – November 2006
- Analyzed NCI's current investments in TR
  - Portfolio analysis
  - Process analysis
- Mapped 6 developmental pathways to clinical goals
- Constituted 6 subcommittees
  - Organization & funding
  - Core services
  - Training/workforce
  - Prioritization
  - Project management
  - External integration

TRWG Subcommittees

Overall Leadership	Organization & Funding	Core Services Coordination	Prioritization
Hawk, Ernest	**Gray, Joe**	**Cowan, Kenneth**	**Tlsty, Thea**
Matrisian, Lynn	**Reid, Brian**	**Schnall, Mitchell**	**Schilsky, Richard***
Nelson, Bill	Bast, Robert*	Bigner, Darell	Abbruzzese, James
	Caligiuri, Michael	Buetow, Kenneth	Emanuel, Peter
	Cote, Richard	Doroshow, James	McGrath, Gail
	Dennis, Phillip	DuBois, Raymond	McTiernan, Anne
	Gomez, Jorge	Jacks, Tyler	Mohla, Suresh
	Gritz, Ellen	Look, A. Thomas	Perez-Soler, Roman
	Hait, William	Maslow, David	Rabkin, Charles
	Kerr, David	Schlom, Jeffrey	Weiner, Louis
	Scheinberg, David		
	Simon, Richard		
	Sullivan, Daniel		

**Serving on more than one subcommittee, as able*

Blue = Co-chairs

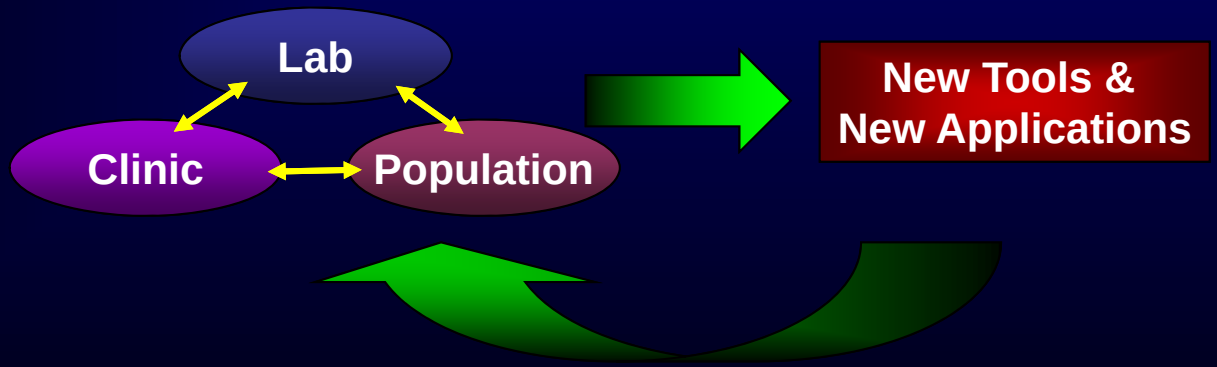
TRWG Subcommittees

Project Management	Training & Workforce	External Integration
Lawrence, Theodore	**Lyerly, H. Kim**	**Courtneidge, Sara**
Limburg, Paul	**Olopade, Olufunmilayo**	**Gordon, Gary**
Collins, Jerry	Bast, Robert*	Alberts, David
Esserman, Laura	Dubinett, Steven	Anderson, Kenneth
Fenton, Laurie	Hong, Waun Ki	Cheever, Martin
Nichols, Cherie	McLeod, Howard	DiBisceglie, Adrian
Sellers, Thomas	Moore, Ida “Ki”	Downing, Gregory
Sidransky, David	Oberholtzer, John Carl	Gilmer, Tona
Srivastava, Sudhir	Schilsky, Richard*	Lubenow, Anne
		Pazdur, Richard**
		Sigal, Ellen

**Serving on more than one subcommittee, as able*
***FDA was represented by various employees*
Blue = Co-chairs

TRWG's Definition of Translational Research

- Research that transforms scientific discoveries arising in the lab, clinic or population into new clinical tools & applications that reduce cancer incidence, morbidity & mortality



www.cancer.gov/trwg

The Translational Continuum*

Refining the TRWG's Scope of Activity

Basic Science Discovery

- Promising molecule or gene target
- Candidate protein biomarker
- Basic epidemiologic finding

Early Translation

- Partnerships & collaboration (academia, government, industry)
- Intervention development*
- Phase I/II trials

Late Translation

- Phase III trials
- Regulatory approval
- Partnerships
- Production & commercialization
- Phase IV trials – approval for additional uses
- Payment mechanism(s) established to support adoption
- Health services research to support dissemination & adoption

Dissemination*

- To community health providers
- To patients & public

Adoption

- Adoption of advance by providers, patients, public
- Payment mechanism(s) in place to enable adoption

Focus of TRWG

Interface with CTWG & its Recommendations

**New drug, assay, device, behavioral intervention, educational materials, training*

**President's Cancer Panel, 2004-2005 Annual Report*

Pathways to Clinical Goals

Risk Assessment

(for screening, diagnosis, staging, response assessment, prognosis, or prediction)

- **Biospecimen-based**

(protocols, reagents, instruments)

- **Image-based**

(agents, techniques)

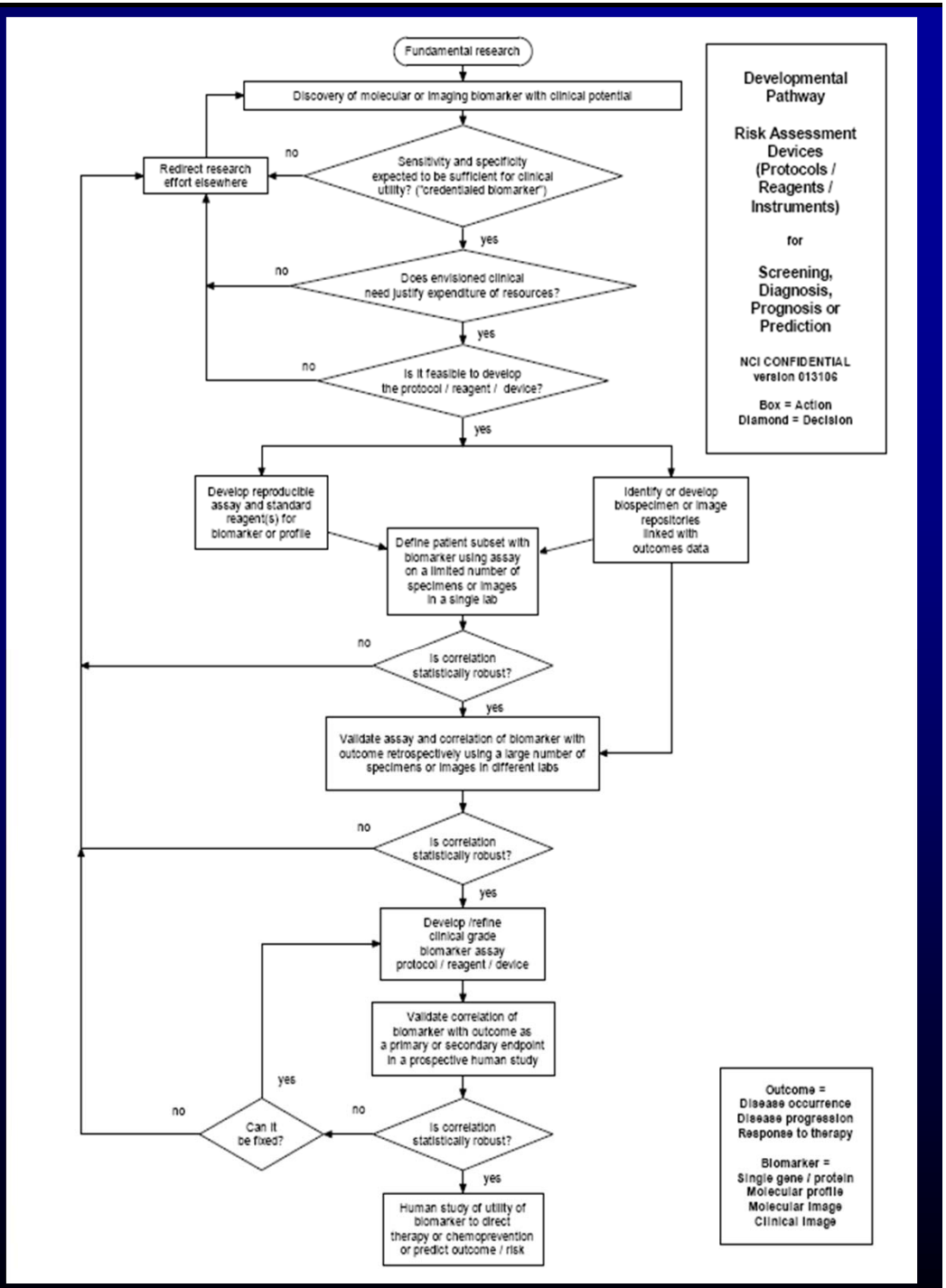
Interventions

- **Agents**

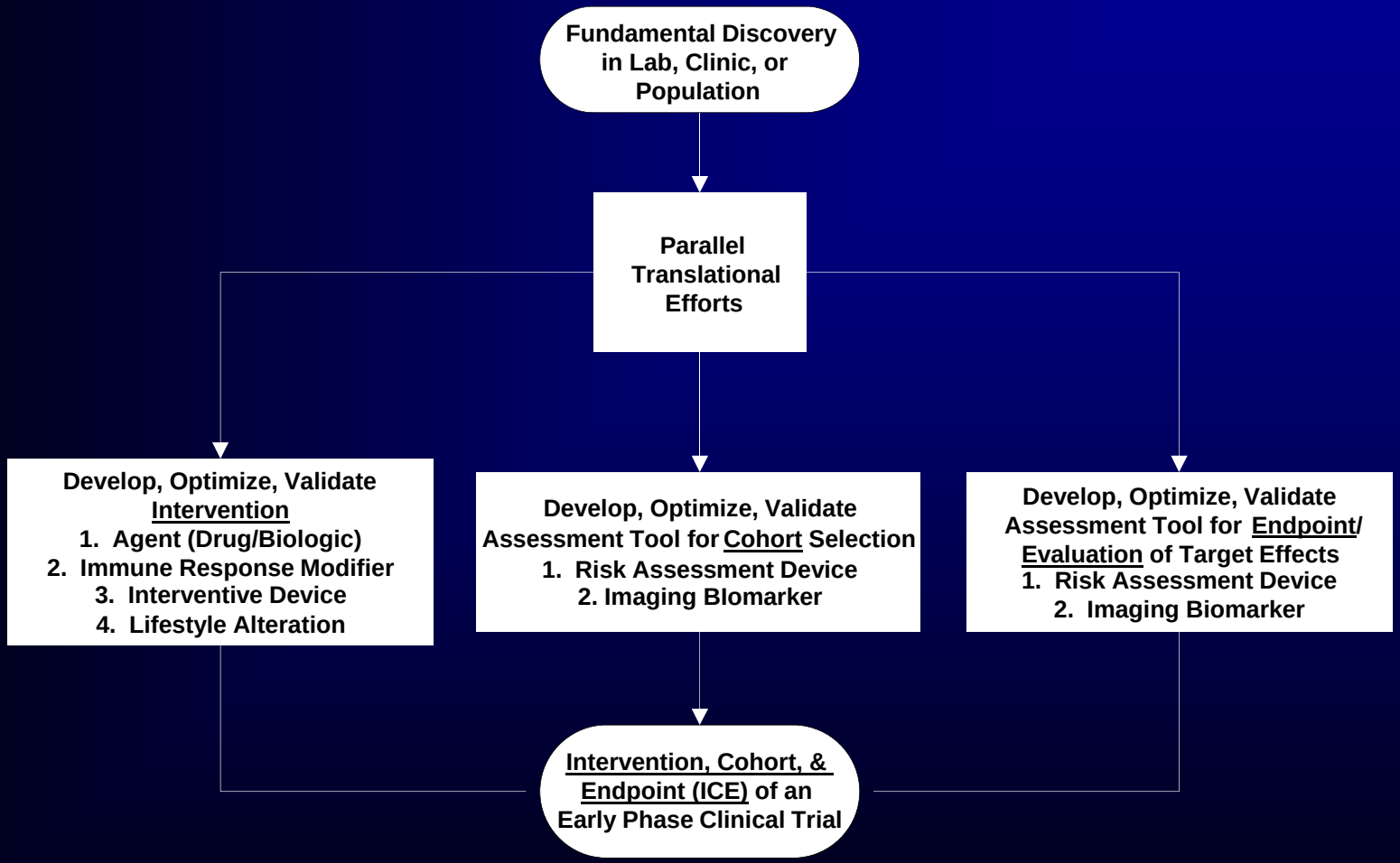
(drugs or biologics)

- **Immune response modifiers**
- **Interventive devices**
- **Lifestyle alterations**

www.cancer.gov/trwg

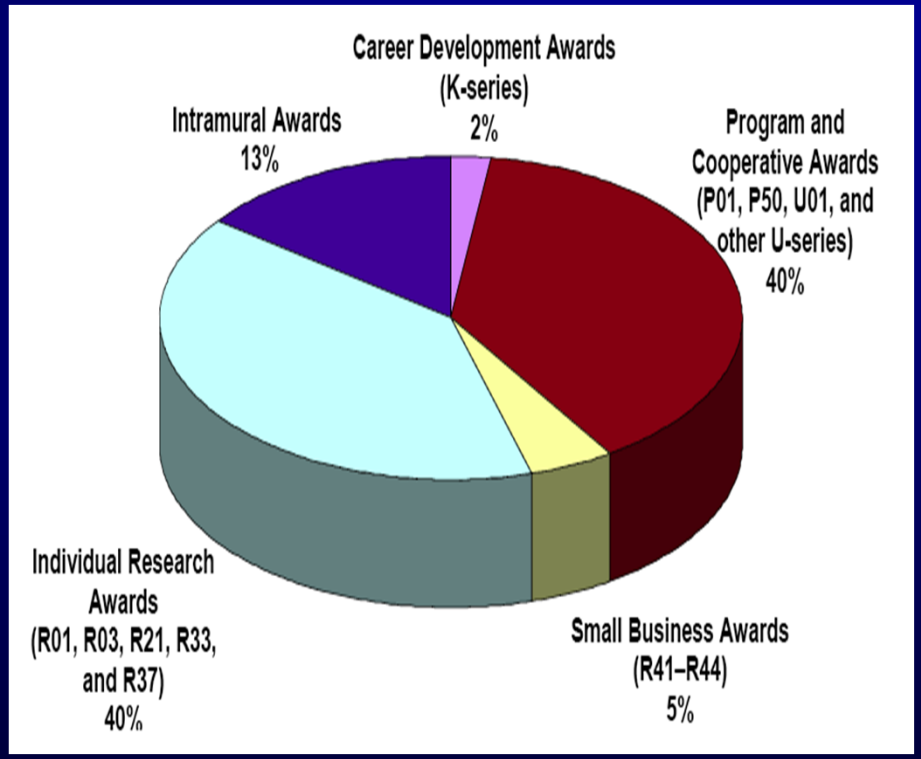


The Convergence of Risk- & Intervention-Related Pathways in Translational Progress



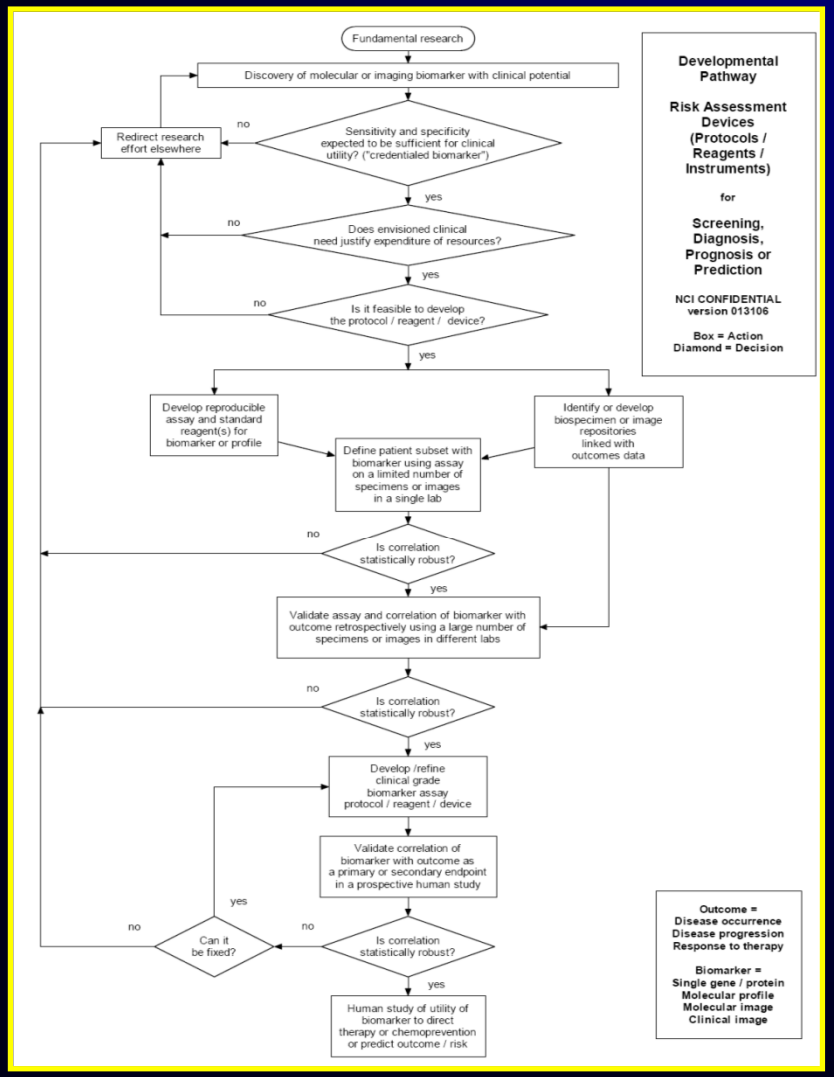
Portfolio Analysis of NCI's Translational Research Funding in FY04

- $1.3B of $4.4B budget (~30%)
  - May be overestimated by 20-40%
- 56% awarded to institutions with NCI-designated cancer centers



- Distributed across funding mechanisms

The Challenge of Early Translation



- How can we best assure that
  - The most promising concepts enter the developmental pathways?
  - Concepts that enter advance to the clinic or to productive failure?
  - Progress is as rapid, efficient & effective as possible?

Translational Research Working Group Report

Summary Vision

Build a focused, collaborative, multi-disciplinary enterprise, tailored to the distinctive requirements of early translational research, which transforms and strengthens this essential link from discovery to patient & public benefit

Translational Research Working Group Report

Key Objectives

- Improve coordination & collaboration & instill a culture of active, goal-oriented management

- Improve identification of the most promising opportunities through a transparent & inclusive prioritization process driven by scientific promise & clinical need

- Tailor new & existing funding programs to facilitate progress & incentivize researcher participation

- Enhance operational efficiency & effectiveness for individual projects and their many supporting activities

Common Themes of TRWG Initiatives

- ***A - Coordinated Management***
  - Facilitate TR through a flexible, integrated NCI organizational approach
  - Achieve a shared understanding of the nature and scope of TR activity
  - Set priorities through a systematic and transparent process involving all stakeholders
- ***B - Tailored Funding Programs***
  - Refine existing programs to promote translational success
  - Create new programs for prioritized projects and to promote industry collaboration
- ***C - Operational Effectiveness***
  - Provide key project management resources
  - Coordinate supporting core services
  - Promote collaborations among NCI, academia, industry and foundations
  - Enhance training and career incentives

Dr. Matrisian

Coordinated Management

Recommended Initiative A1

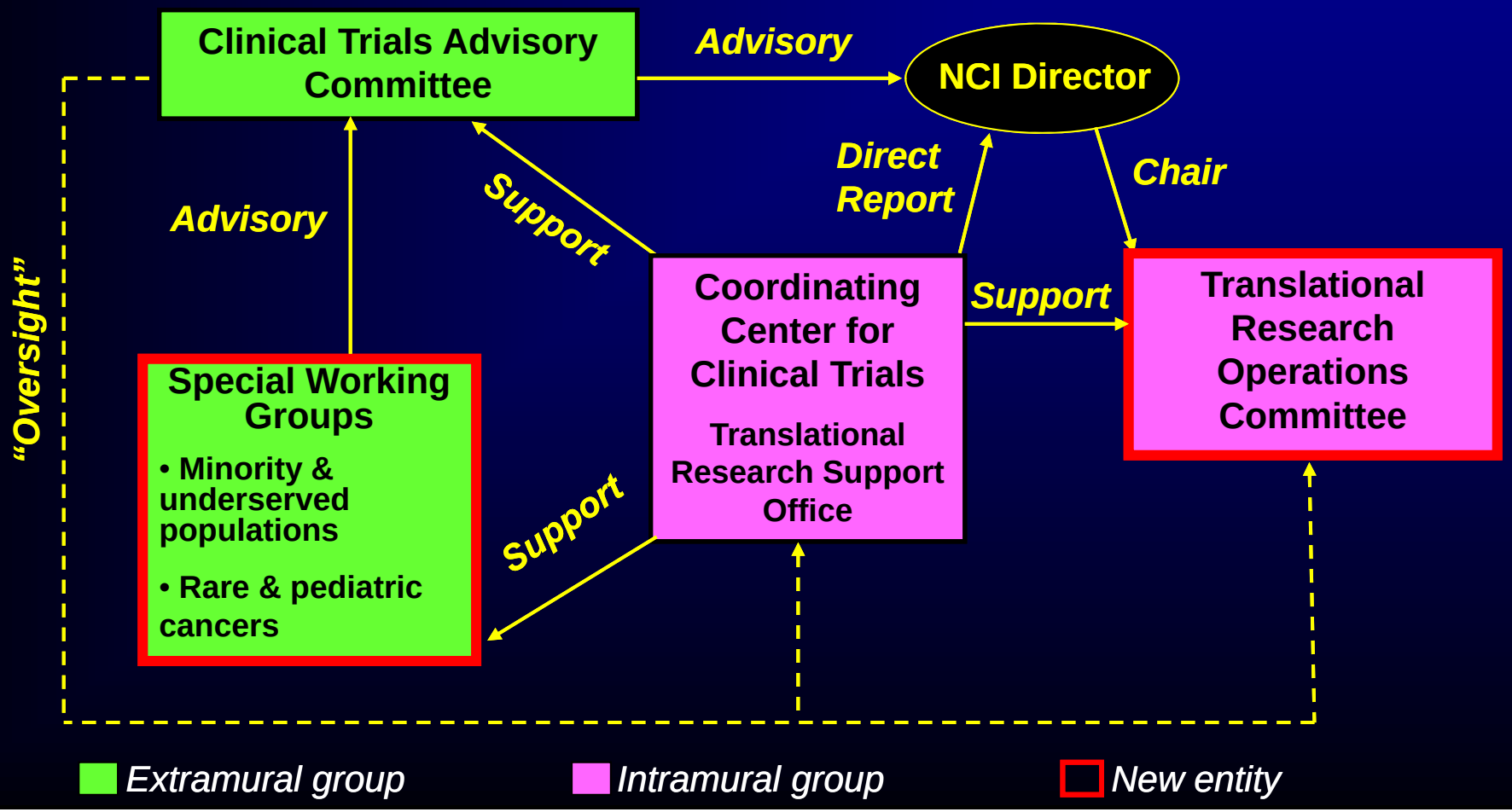
Establish a coordinated NCI-wide organizational approach to manage the diverse early translational research portfolio, reduce fragmentation and redundancy, and ensure that resources are focused on the most important and promising opportunities.

- Scope of Clinical Trials Advisory Committee (CTAC) extended to provide external oversight to translational research
- Translational Research Operations Committee including NCI Divisions, Centers and Offices to provide internal management structure
- Translational Research Support Office created within Coordinating Center for Clinical Trials to provide operational support
- CTAC Special Working Groups established to address Minority and Underserved Populations and Rare and Pediatric Cancers

Coordinated Management

(Initiative A1)

Relationship of Proposed TRWG Coordinated Management Entities



Coordinated Management

Recommended Initiative A2

Designate a specific portion of the NCI budget for early translational research to facilitate coordinated management, long-term planning, and prioritization among opportunities and approaches as well as to demonstrate NCI's commitment to translational research.

- Target to be established by Clinical Trials Advisory Committee – anticipated to be in 25-35% range
- Budget to encompass four early translational research components
  - Solicited (RFA/PA-directed) programs
  - Unsolicited, investigator-initiated awards identified as translational by new coding system
  - New funding programs recommended by TRWG Report
  - Operational expenses associated with implementing TRWG Initiatives

Coordinated Management

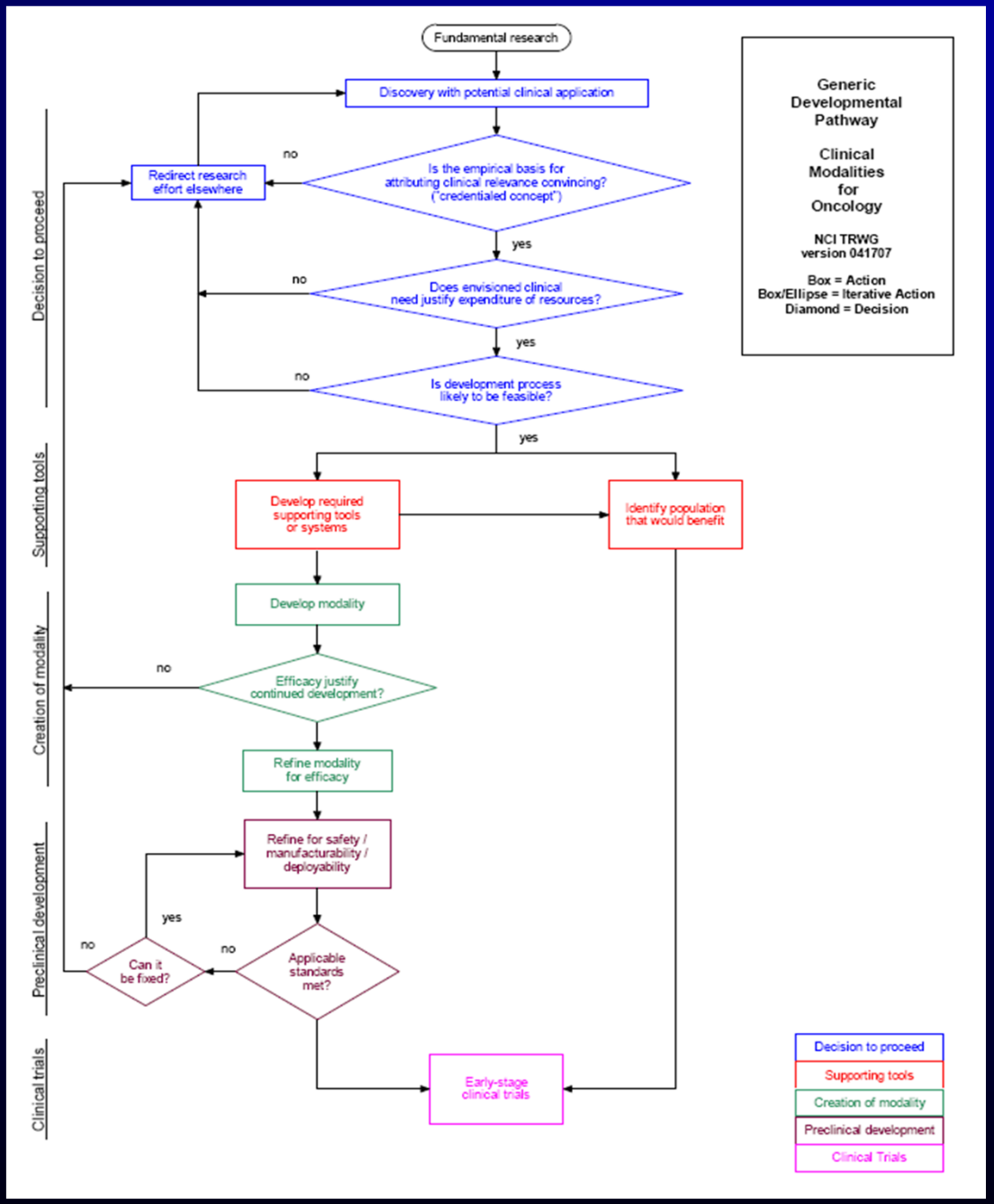
Recommended Initiative A3

Develop a set of award codes that accurately captures the nature and scope of the early translational research portfolio to enable a complete, shared understanding of NCI's total investment, help identify gaps and opportunities, and demonstrate the extent of translational activity to the public.

- New award codes to reflect key elements of the six TRWG developmental pathways to clinical goals
- New codes to be integrated with existing NCI coding and portfolio analysis systems
- Seek input on best practices from other federal agencies (e.g. DOD) with relevant coding systems

Coding Grant Applications to the Translational Research Developmental Pathways:

- Decision to proceed
- Supporting tools
- Creation of modality
- Preclinical development
- Clinical trials



www.cancer.gov/trwg

Coordinated Management

Recommended Initiative A4

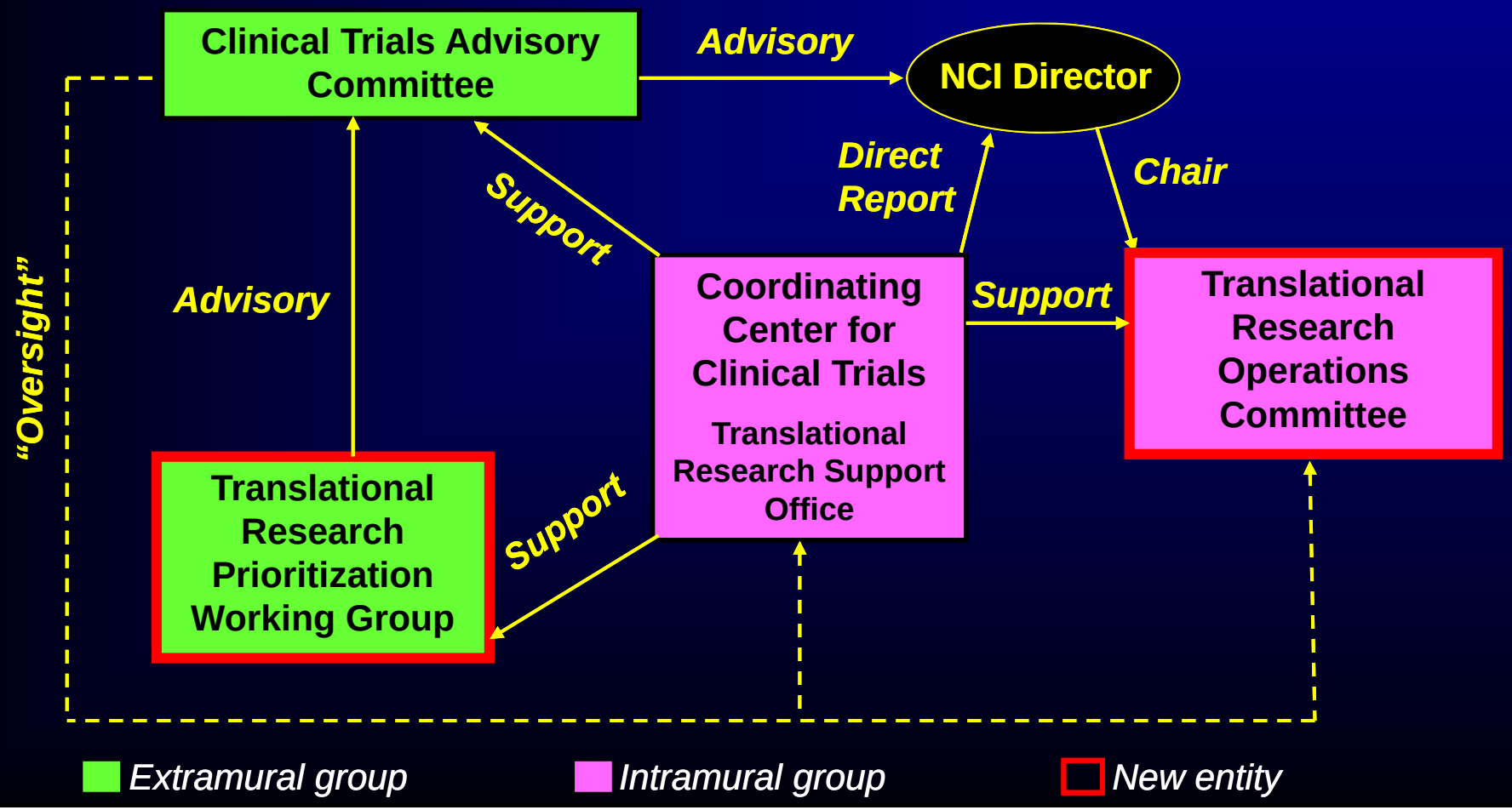
Create a transparent, inclusive prioritization process to identify the most promising early translational research opportunities based on scientific quality, technical feasibility and expected clinical or public health impact.

- Process to be managed by a Translational Research Prioritization Working Group of the Clinical Trials Advisory Committee
- Prioritization process to be carried out annually in a systematic and transparent manner
- Process will identify specific targets for new special awards while also informing existing translational research funding initiatives

Coordinated Management

(Initiative A4)

Relationship of Proposed Prioritization Process with Coordinated Management Entities



Recommended Prioritization Process

Current Approach

- NCI-initiated solicitations
  - Generated within Branches/Divisions
    - Scientific premise, portfolio analysis, proposed budget, evaluation metrics
  - Approved by Executive Committee
  - Approved by BSA/BSC
  - Second-level review & award concurrence by NCAB
- Investigator-initiated projects
  - Peer-review's project-specific scientific priority score
  - Mild programmatic discretion at the Branch or Divisional level
  - Second-level review & concurrence by NCAB

Proposed Additional Approach

Translational Research Prioritization Working Group

Broad public input (RFI)

↓

10 ideas chosen for detailed analysis

- **scientific validity**
- **feasibility**
- **clinical need**
- **public (vs. a private sector) priority**

↓

5 concept packages

↓

Public comment

↓ ↓

2-3 Special Awards

Inform existing NCI initiatives

Tailored Funding Programs

Recommended Initiative B1

Modify guidelines for multi-project collaborative early translational research awards to focus research on advancing specific opportunities along a developmental pathway toward patient benefit, and to reward collaborative team science.

- Incorporate project milestones
- Require a development/commercialization strategy
- Promote and reward collaborations
- Allow budgetary flexibility for projects that meet milestones
- Review panels to include industry scientists, non-academic health professionals, program managers from foundations and patient advocates as well as academic translational researchers

Tailored Funding Programs

Recommended Initiative B2

Improve processes and mechanisms for review and funding of investigator-initiated early translational research to incentivize researchers to propose such studies.

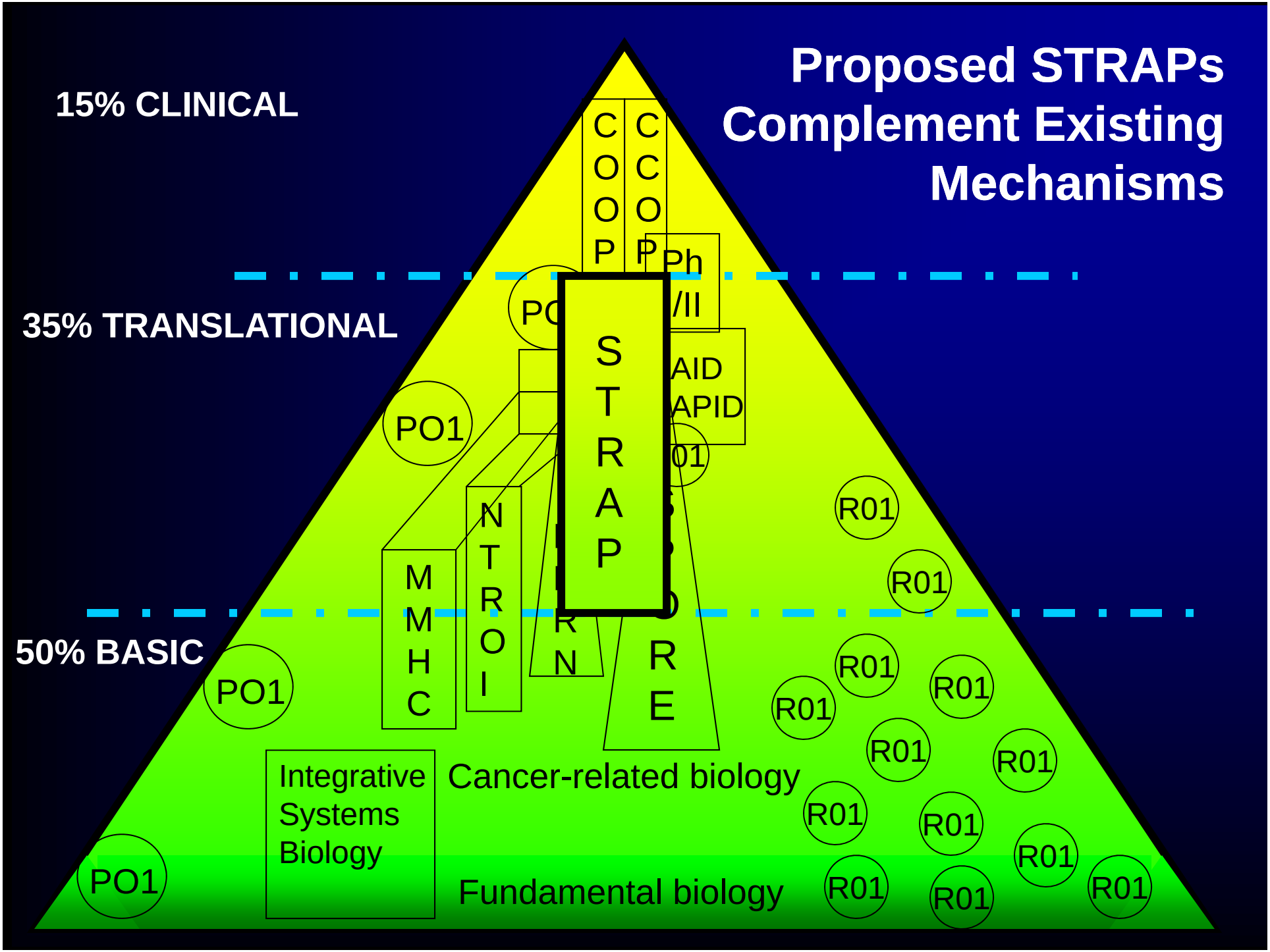
- Analyze translational research study section membership and practices
- Pursue NIH-wide initiative to examine value of distinctive R-series and P-series mechanisms for supporting investigator-initiated translational research

Tailored Funding Programs

Recommended Initiative B3

Establish Special Translational Research Acceleration Project (STRAP) awards to advance a select number of especially promising early translational research opportunities identified through the newly created prioritization process.

- Solicit proposals annually for specific opportunities
- $10M of new awards annually beginning in year 3 (FY2010), steady state of $50M in annual STRAP funding after 5 years
- STRAP program requirements:
  - Project plan through early stage human studies
  - Project management plan
  - Specific development milestones and timeline
  - Development/commercialization strategy


Proposed STRAPs Complement Existing Mechanisms
15% CLINICAL
35% TRANSLATIONAL
50% BASIC
COOP
COOP
Ph
/II
PO
STRAP
AID
APID
01
PO1
NTROI
MMHC
R
N
RE
R01
R01
R01
R01
R01
R01
R01
R01
R01
R01
PO1
PO1
Integrative Systems Biology
Cancer-related biology
Fundamental biology

Dr. Nelson

Tailored Funding Programs

Recommended Initiative B4

Establish a program for joint NCI/industry funding of collaborative early translational research projects that integrate the complementary strengths of both parties to pursue opportunities that are more attractive as a combined effort.

- Establish an Industry Relations Working Group to lay groundwork for negotiation of collaborative funding arrangements
- $5M of new awards annually beginning in year 4 (FY2011), steady state of $25M in annual funding after 5 years
- RFA-directed solicitation and award process
- Program requirements:
  - Project plan through hand-off to industry partner
  - Joint industry/academic Steering Committee
  - Negotiated intellectual property/licensing plan
  - Specific development milestones and timeline

Tailored Funding Programs

Recommended Initiative B5

Integrate access to GMP/GLP manufacturing and other preclinical development services more effectively with high-priority, milestone-driven early translational research projects to better address this often rate-limiting step in moving a product forward to early human testing.

- Preclinical milestone reviews integrated with review processes for NCI developmental resources program (RAID, RAPID or DCIDE) to avoid duplicative review
- No change in current review process for investigator-initiated applications to RAID, RAPID or DCIDE
- Development experts involved in earlier milestone reviews to help identify and solve potential obstacles in toxicology, pharmacology or manufacturing

Operational Effectiveness

Recommended Initiative C1

Build a project management system involving staff both at NCI and at extramural institutions to facilitate coordination, communication, resource identification and access, and management of milestone-based progress for multi-disciplinary, early translational research projects.

- Overall system coordination provided by Translational Research Support Office (TRSO)
- Project-specific management for existing programs provided by program staff and for new STRAP and academic/industry awards by TRSO
- NCI project managers work in collaboration with institutionally-based project managers
- Formal project management training will be provided as needed

Operational Effectiveness

Recommended Initiative C2

Coordinate core services essential for early translational research to reduce duplication and ensure that high quality services are readily accessible to all projects and investigators.

- Identify and analyze existing core services for redundancy
- Consolidate redundant core services with emphasis on primary role of Cancer Centers as providers of core services
- Develop comprehensive, publicly-accessible database of core services
- Establish regional centers of excellence for highly technical, equipment or resource intensive core services that are inefficient to operate locally

Operational Effectiveness

Recommended Initiative C3

Improve standardization, quality control and accessibility of annotated biospecimen repositories and their associated analytic methods to strengthen this key translational resource.

- Reinforce standardization and specimen and data sharing efforts of the Office of Biorepositories and Biospecimen Research (OBBR) including an informed consent template for future use of tissue
- Modify program guidelines to incorporate OBBR's First Generation Biorepository Guidelines
- Provide funding for guideline-compliant biospecimen collection in clinical trials
- Assist OBBR in developing new approaches to creation of a national biospecimen repository network
- Develop standardized analytic methods for biospecimens

Operational Effectiveness

Recommended Initiative C4

Develop enhanced approaches for negotiation of intellectual property agreements and agent access to promote collaborations among industry, academia, NCI and foundations.

- Work with Technology Transfer Branch (TTB) to coordinate development of model agreements and best practices
- Work with TTB to evaluate alternative approaches to resolving intellectual property issues such as patent pools and government-industry consortia
- Evaluate the feasibility of developing or enhancing a range of possible NCI-operated agent repositories

Operational Effectiveness

Recommended Initiative C5

Increase NCI interaction and collaboration with foundations and advocacy groups to capitalize upon their complementary skills and resources for advancing early translational research.

- Establish leadership position responsible for coordinating interactions with foundations and advocacy groups
- Implement more systematic, structured approach to interaction with foundations and advocacy groups
- Include foundation/advocacy representative in translational research Prioritization Working Group
- Explore approaches to avoiding duplicative proposal review
- Develop funding partnerships for targeted TR projects
- Work with foundations and advocacy groups to enhance outreach re tissue donation and image collection

Operational Effectiveness

Recommended Initiative C6

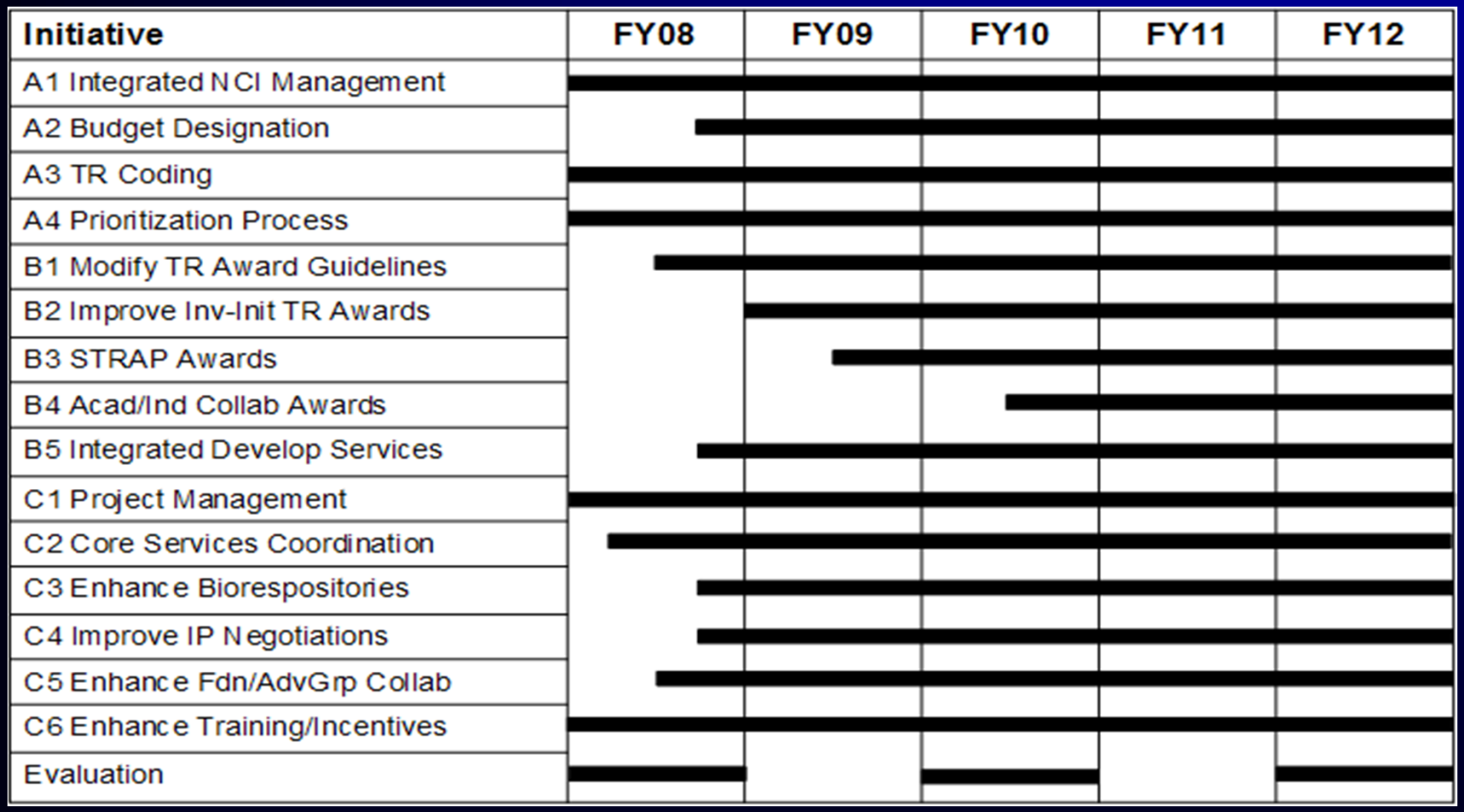
Enhance training programs and career incentives to develop and maintain a committed early translational research workforce.

- Develop Program Announcement highlighting training opportunities for early translational research
- Establish Translational Research Training Working Group to make recommendations on the training of clinician-scientists, PhD scientists and PhD nurses for TR
- Expand regulatory affairs training
- Revise funding programs and award guidelines to reward TR
- Collaborate with other organizations to adjust academic reward practices to enhance TR career support and incentives

Principles Guiding Timeline and Budget

- Organizational and administrative initiatives should be initiated ASAP
- Prioritization process must be in place before STRAPs can commence
- Budget for administration will be kept to a minimum by leveraging existing structures
- Recommended extramural funding programs will require < 1% of the NCI budget

TRWG Initiative Summary Timeline



TRWG Initiative Summary Budget

Initiative	FY08	FY09	FY10	FY11	FY12
A1 Integrated NCI Management	$800K	$800K	$850K	$850K	$850K
A2 Budget Designation	---	---	---	---	---
A3 TR Coding	$?K	$150K	$150K	$150K	$150K
A4 Prioritization Process	$950K	$750K	$750K	$750K	$750K
B1 Modify TR Award Guidelines	---	---	---	---	---
B2 Improve Inv-Init TR Awards	---	---	---	---	---
B3 STRAP Awards	---	---	$10M	$20M	$30M
B4 Acad/Ind Collab Awards	---	---	---	$5M	$10M
B5 Integrated Develop Services	---	---	---	---	---
C1 Project Management	$1.35M	$1.30M	$1.55M	$1.75M	$2.0M
C2 Core Services Coordination	$200K	$370K	---	---	---
C3 Enhance Biorespositories	---	---	---	---	---
C4 Improve IP Negotiations	$100K	$520K	---	---	---
C5 Enhance Fdn/AdvGrp Collab	---	---	---	---	---
C6 Enhance Training/Incentives	$300K	$100K	---	---	---
Evaluation	$350K	---	$350K	---	$350K
TOTAL	**$4.05M**	**$3.99M**	**$13.65**	**$28.5M**	**$44.1M**

Dr. Hawk

Context for the TRWG Recommendations

- Unrestricted mission, yet aware of current realities
- No impact on Discovery Research
  - Should remain “unmanaged”
- Firmly committed to the vision
  - TRWG’s assessment of the challenges (why?)
  - TRWG’s goals (what?)
- Strived to identify “responsible” implementation strategies (when, who, how?), so recommendations are:
  - Reasonably detailed
  - Intentionally incremental
  - Representative of a consensus view
- Aware that implementation plans should be flexible to adjust to the environment

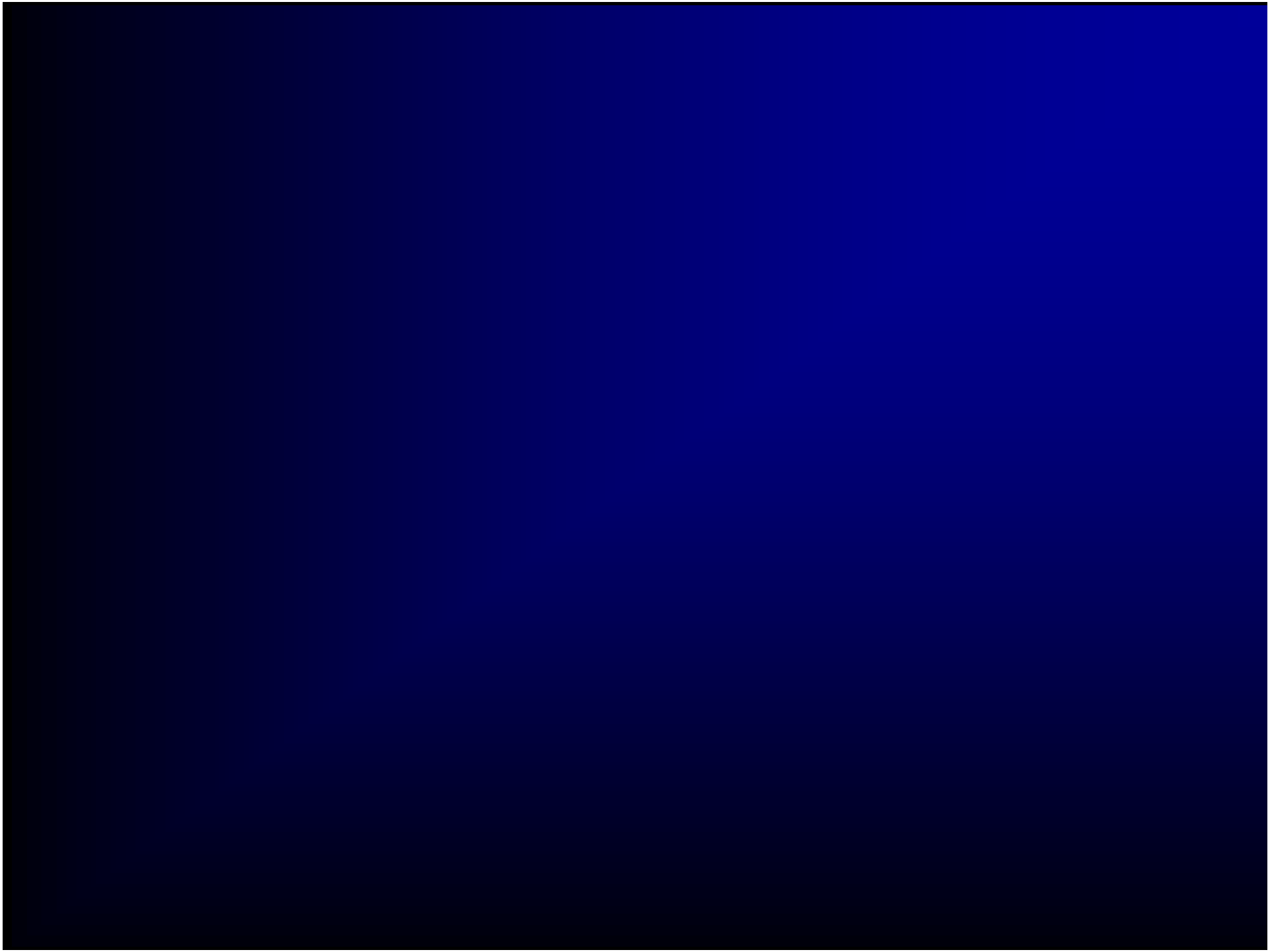
Proposed Next Steps

- Publish the six pathways to clinical goals
- Develop translational research award codes based on pathways
- Implement communications plan for TRWG Report
- Convene an internal working group to discuss implementation strategies

Acknowledgements

- National Cancer Institute
  - Anna Barker, PhD
  - Jim Doroshow, MD
  - Gary Dorfman, MD
  - Maureen Johnson, PhD
  - Jennifer Kwok
  - Anne Lubenow
  - Cherie Nichols, MBA
  - John Niederhuber, MD
  - Henry Rodriguez, PhD, MBA
  - Lisa Stevens, PhD
  - Jaye Viner, MD, MPH
- Science & Technology Policy Institute
  - Oren Grad, MD, PhD
  - Judy Hautala, PhD
  - Maureen McArthur
  - Alexis Wilson
  - Brian Zuckerman, PhD
- Science Applications International Corp.
  - Jeff Zalatoris, PhD
- NOVA Research
  - Janet Braun
  - Ray Butler
  - Erin Milliken, PhD
  - Dana Young, JD
- Vanderbilt University
  - David Dilts, PhD, MBA
  - **Lynn Matrisian, PhD**
  - Vanessa Hill
- Johns Hopkins University
  - **Bill Nelson, MD, PhD**
- Jane Reese-Coulbourne, MS, MBA

…and the 57 Other Members of the Translational Research Working Group



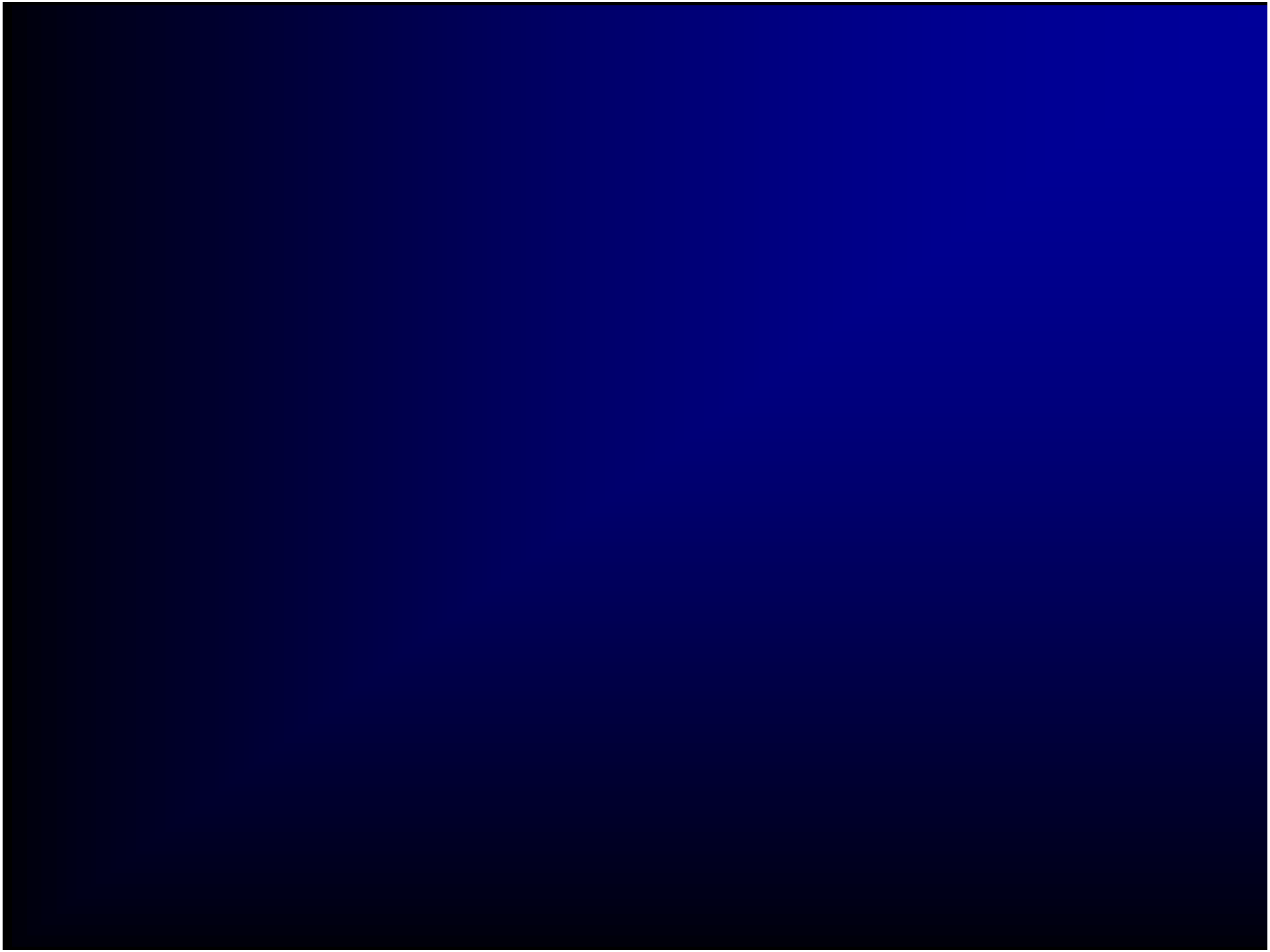
Back-ups

Potential Programmatic Utility of Developmental Pathways

- Experimental Design
  - Efficiently plan, define, & explain
    - Scientific goals and process
    - Timeline
    - Required resources
- Project Management
  - Predict potential impediments by stage
  - Measure progress
  - Evaluate causes of delays/accelerations
  - Guide redesign as necessary/appropriate
- Support Collaborations & “Hand-offs”
  - Predict, plan, & facilitate timing & requirements re: critical interfaces
  - Anticipate budgetary implications of shared T&E/resources
- Support Fiscal Management
  - Toll-gated installments (reward mechanisms?)
  - Demonstrate return on investment by “hitting”/exceeding target

TRWG Products

- TR definition
- Six developmental pathways to clinical goals
- Portfolio analysis
  - Review of NCI's current TR activities
- Process analysis
  - Case studies of 20 examples of translation in practice
- Draft final recommendations



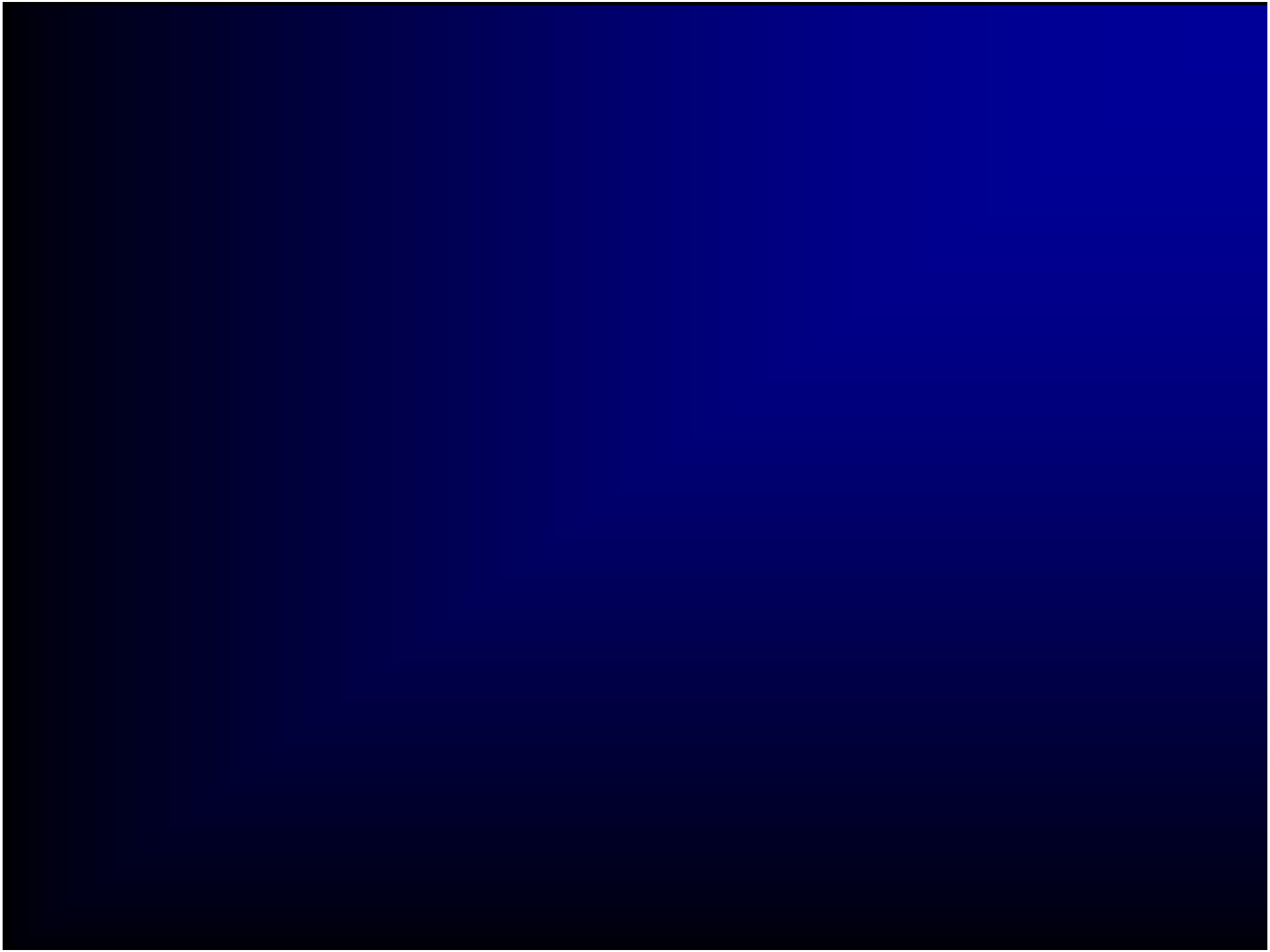
Obstacles to TR Progress – From the TRWG's Perspective

Obstacles to Meeting the Challenge

- Insufficient coordination & integration across NCI results in a fragmented TR effort that risks duplication & may miss important opportunities
- Absence of clearly designated funding & adequate incentives for researchers threatens the perceived importance of TR within the NCI enterprise
- Absence of a structured, consistent review & prioritization process tailored to the characteristics & goals of TR makes it difficult to direct resources to critical needs & opportunities

Obstacles to Meeting the Challenge

- TR core services are often duplicative & inconsistently standardized, with capacity poorly matched to need
- Multidisciplinary nature of TR & the need to integrate sequential steps in complex development pathways warrants dedicated project management resources
- Insufficient collaboration & communication between basic & clinical scientists & the paucity of effective training opportunities limits the supply of experienced translational researchers
- Inadequate collaboration with industry delays appropriate developmental hand-offs



TRWG Members – Broad Expertise

Programmatic Representation on the TRWG

(CRISP Database, 2000-2006)

- **Cancer Centers (7)**
  - David Alberts
  - Michael Caligiuri
  - Kenneth Cowan
  - Raymond Dubois
  - Peter Emanuel
  - William Hait
  - H. Kim Lyerly
- **Industry (4)**
  - Martin Cheever
  - Sara Courtneidge
  - Tona Gilmer
  - Gary Gordon
- **EDRN (2)**
  - David Sidransky
  - Sudhir Srivastava
- **Advocates (3)**
  - Laurie Fenton
  - Gail McGrath
  - Ellen Sigal
- **SPOREs (14)**
  - James Abbruzzese
  - Kenneth Anderson
  - Robert Bast
  - Darell Bigner
  - Richard Cote
  - Steven Dubinett
  - Laura Esserman
  - Joe Gray
  - Waun Ki Hong
  - Lynn Matrisian
  - William Nelson
  - Olufunmilayo Olopade
  - David Sidransky
  - Thea Tlsty
- **Clinical Study Consortia (5)**
  - David Alberts
  - Michael Caligiuri
  - James Doroshow
  - Paul Limburg
  - Richard Schilsky
- **P01s (17)**
  - David Alberts
  - Kenneth Anderson
  - Robert Bast
  - Michael Caligiuri
  - Richard Cote
  - Steven Dubinett
  - Raymond Dubois
  - Gary Gordon
  - Joe Gray
  - Waun Ki Hong
  - Theodore Lawrence
  - A. Thomas Look
  - H. Kim Lyerly
  - Brian Reid
  - David Scheinberg
  - Mitchell Schnall
  - Thomas Sellers

Programmatic Representation on the TRWG

(CRISP Database, 2000-2006)

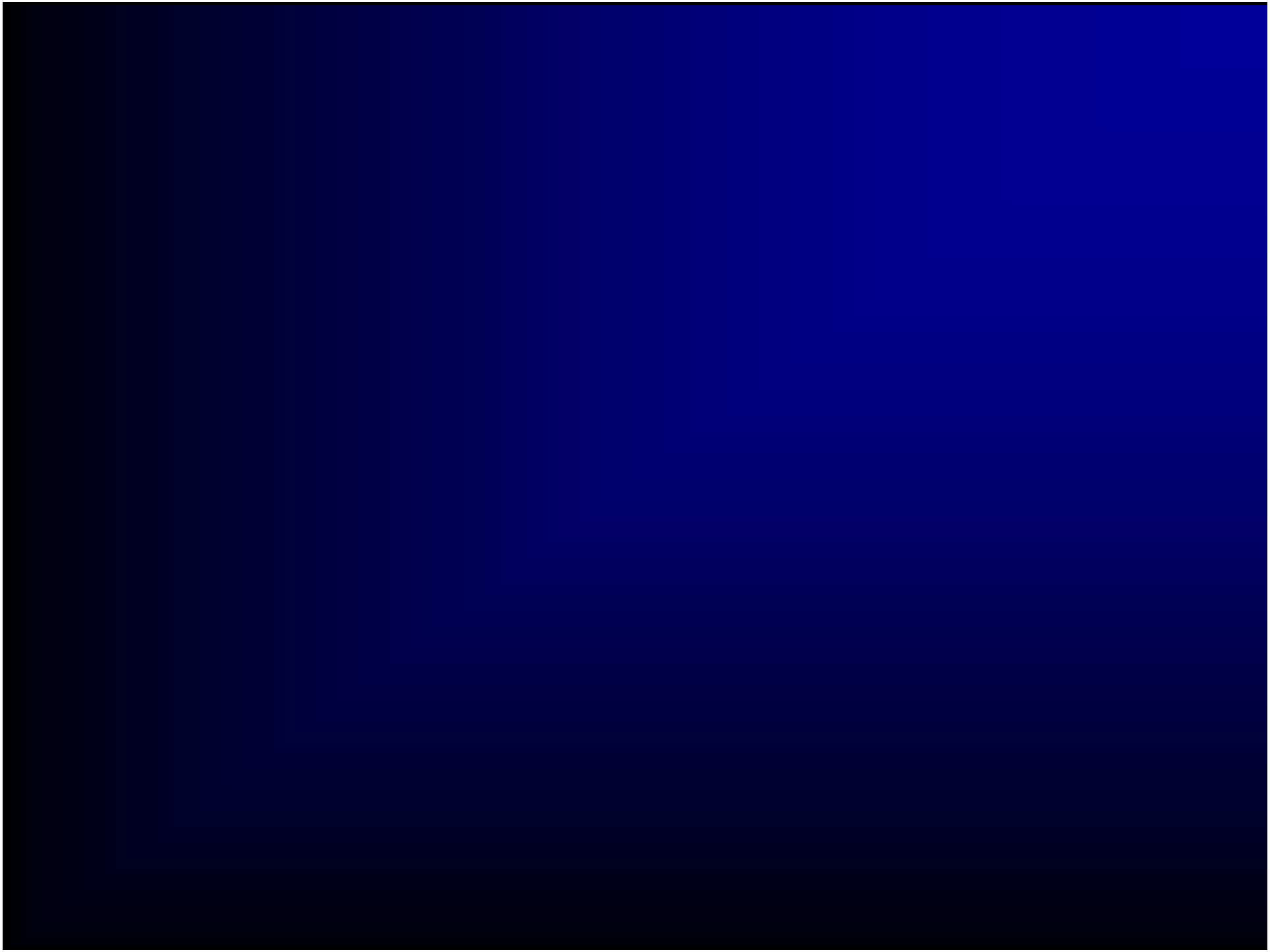
- **R01s (30)**
  - Kenneth Anderson
  - Robert Bast
  - Michael Caligiuri
  - Martin Cheever
  - Richard Cote
  - Sara Courtneidge
  - Adrian DiBisceglie
  - James Doroshow
  - Steven Dubinett
  - Raymond Dubois
  - Peter Emanuel
  - Ellen Gritz
  - William Hait
  - Theodore Lawrence
  - Paul Limburg
  - A. Thomas Look
  - H. Kim Lyerly
  - Lynn Matrisian
  - Anne McTiernan
  - Ida “Ki” Moore
  - William Nelson
  - John Carl Oberholtzer
- **R01s (cont.)**
  - Olufunmilayo Olopade
  - Roman Perez-Soler
  - Brian Reid
  - David Scheinberg
  - Thomas Sellers
  - David Sidransky
  - Thea Tlsty
  - Louis Weiner
- **Training/Education (15)**
  - David Alberts (R25, T32)
  - Robert Bast (K12, T32)
  - Michael Caligiuri (T32)
  - James Doroshow (K12)
  - Raymond Dubois (T32)
  - Peter Emanuel (T32)
  - Waun Ki Hong (T32)
  - H. Kim Lyerly (K12, T32)
  - Lynn Matrisian (T32)
  - Ida “Ki” Moore (T32)
  - Olufunmilayo Olopade (T32)
  - David Scheinberg (K12)
  - Mitchell Schnall (T32)
- **Training/Ed (cont.)**
  - Thomas Sellers (R25)
  - Louis Weiner (K12)
- **Federal Gov’t (17)**
  - Kenneth Buetow (CB)
  - Jerry Collins (DCTD)
  - Phillip Dennis (CCR)
  - James Doroshow (DCTD)
  - Gregory Downing (OTIR)
  - Jorge Gomez (OCTR)
  - Ernest Hawk (OCTR)
  - Anne Lubenow (OC)
  - David Maslow (DEA)
  - Suresh Mohla (DCB)
  - Cherie Nichols (OSPA)
  - John Carl Oberholtzer (OCTR)
  - Richard Pazdur (FDA)
  - Charles Rabkin (DCEG)
  - Jeffrey Schlom (CCR)
  - Richard Simon (DCTD)
  - Sudhir Srivastava (DCP)
  - Daniel Sullivan (DCTD)

TRWG Expertise in Various Populations

- Head & Neck
  - Waun Ki Hong
  - David Sidransky
- Lung
  - Phillip Dennis
  - Steven Dubinett
  - Laurie Fenton
  - Waun Ki Hong
  - Roman Perez-Soler
- Stomach/Esophagus
  - Ernest Hawk
  - Paul Limburg
  - Brian Reid
- Pancreas
  - James Abbruzzese
- Liver
  - Adrian DiBisceglie
  - Theodore Lawrence
  - Charles Rabkin
- **Colorectum**
  - James Doroshow
  - Raymond Dubois
  - Ernest Hawk
  - Paul Limburg
  - Richard Pazdur
  - Jeffrey Schlom
- **Breast**
  - Kenneth Cowan
  - Laura Esserman
  - Joe Gray
  - William Hait
  - H. Kim Lyerly
  - Anne McTiernan
  - Olufunmilayo Olopade
  - Mitchell Schnall
  - Thomas Sellers
  - Thea Tlsty
- Ovary/Gyn
  - David Alberts
  - Robert Bast
  - Thomas Sellers
- GU
  - Richard Cote
- Prostate
  - William Nelson
- Brain
  - Darrel Bigner
- Skin
  - David Alberts
- Leukemia/Lymphoma
  - Michael Caligiuri
  - Peter Emanuel
  - A. Thomas Look
  - David Scheinberg
- Myeloma
  - Kenneth Anderson

TRWG Expertise in Special Scientific Areas

- **Prevention**
  - David Alberts
  - Adrian DiBisceglie
  - Steven Dubinett
  - Raymond Dubois
  - Laura Esserman
  - Gary Gordon
  - Ellen Gritz
  - Ernest Hawk
  - Waun Ki Hong
  - Paul Limburg
  - Lynn Matrisian
  - Anne McTiernan
  - William Nelson
  - Olufunmilayo Olopade
  - Charles Rabkin
  - Brian Reid
  - Thomas Sellers
  - David Sidransky
  - Sudhir Srivastava
  - Thea Tlsty
- **Pediatrics**
  - Peter Emanuel
  - A. Thomas Look
- **Survivorship**
  - Ida “Ki” Moore
- **Genetics**
  - Kenneth Buetow
  - Joe Gray
  - Olufunmilayo Olopade
  - William Nelson
  - Charles Rabkin
  - Thomas Sellers
  - David Sidransky
- **Imaging**
  - Daniel Sullivan
  - Mitchell Schnall
- **Drugs/Immunologics**
  - James Abbruzzese
  - David Alberts
  - Kenneth Anderson
  - Martin Cheever
  - Jerry Collins
  - Michael Caligiuri
  - Sara Courtneidge
  - Kenneth Cowan
  - James Doroshow
  - Tona Gilmer
- **Drugs/Immunologics (cont.)**
  - Gary Gordon
  - William Hait
  - Ernest Hawk
  - Waun Ki Hong
  - Paul Limburg
  - H. Kim Lyerly
  - William Nelson
  - Richard Pazdur
  - Roman Perez-Soler
  - David Scheinberg
  - Jeffrey Schlom
  - Richard Schilsky
  - Ellen Sigal
  - Richard Simon
  - Louis Weiner
- **Biobehavior**
  - Ellen Gritz
  - Anne McTiernan
- **Preclinical Models**
  - Lynn Matrisian
  - Suresh Mohla
  - Thea Tlsty



Details of the TRWG Portfolio Analysis

NCI Programmatic Involvement in Developmental Pathways

Pathway Steps / Pathway	Early Development of Intervention	Enabling technologies (e.g., assays, repositories, models)	Refinement	Manufacturing/ Production	Early-stage trials
Agents (not including imaging agents)	SPORE, NCDDG, CCNE, R01, P01, Z01	MMHCC, CPTAC, SPORE, NCDDG, CCNE, R01, P01, Z01	SPORE, RAID, RAPID, NCDDG, CCNE, R01, P01, Z01	SPORE, RAID, RAPID, CCNE, R01, P01, Z01	Cancer Centers, Cooperative Groups, SPORE, DCP Phase I/II, DCTD Phase I/II, R01, P01, Z01
Immune Response Modifiers	SPORE, NCDDG, CCNE, R01, P01, Z01	MMHCC, SPORE, NCDDG, CPTAC, CCNE, R01, P01, Z01	SPORE, RAID, RAPID, NCDDG, CCNE, R01, P01, Z01	SPORE, RAID, RAPID, R01, P01, Z01	Cancer Centers, Cooperative Groups, SPORE, DCTD Phase I/II, R01, P01, Z01
Risk Assessment Devices (Biomarkers)	SPORE, EDRN, CPTAC, CCNE, R01, P01, Z01	MMHCC, EDRN, CPTAC, CCNE, R01, P01, Z01	SPORE, EDRN, CCNE, R01, P01, Z01	SPORE, CCNE, R01, P01, Z01	SPORE, EDRN, R01, P01, Z01
Risk Assessment Devices (Imaging, Imaging Agents, and Imaging Devices)	SPORE, ICMIC, NTROI, CCNE, R01, P01, Z01	MMHCC, CPTAC, ICMIC, NTROI, CCNE, R01, P01, Z01	SPORE, ICMIC, NTROI, DCIDE, CCNE, R01, P01, Z01	SPORE, ICMIC, NTROI, DCIDE, CCNE, R01, P02, Z01	Cancer Centers, CIP Quick Trials, SPORE, ICMIC, NTROI, R01, P01, Z01
Interventive Devices	SPORE, CCNE, R01, P01, Z01	MMHCC, CPTAC, SPORE, CCNE, R01, P01, Z01	SPORE, CCNE, R01, P01, Z01	SPORE, R01, P01, Z01	SPORE, Cancer Centers, Cooperative Groups, R01, P01, Z01
Lifestyle Interventions	SPORE, R01, P01, Z01	MMHCC, MMHCC, SPORE, R01, P01, Z01	SPORE, R01, P01, Z01	SPORE, R01, P01, Z01	Cancer Centers, SPORE, Cooperative Groups, R01, P01, Z01

Portfolio Analysis: Key Findings

- Awards are not adequately categorized to provide meaningful, detailed quantitative assessments of translational content
- TR is funded by most NCI Divisions, Offices & Centers
- TR is funded by a range of mechanisms – individual, collaborative, & facilitated
- The majority of TR awards are to NCI-designated Cancer Centers

Portfolio Analysis: Program and Cooperative Awards

Award Category	Translational Awards	Total Active Awards	% Translational	TR Award Funding in FY04 ($M)
P01*	107	207	51.7%	$215.0
P20	8	34	23.5	3.0
SPORE* (P50)	58	58	100	$131.7
ICMIC (P50)	7	7	100	15.8
EDRN (U01/U24)	28	28	100	21.8
MMHCC (U01)	10	23	43.5	8.1
Other U01	122	209	58.4	98.6
U19	5	18	27.8	3.7
NTROI (U54)	3	3	100	3.8
Other U54	10	19	52.6	13.0
U56	4	40	10.0	3.1

*P01s and SPOREs are multi-component awards that typically include both research projects & core facilities.

Portfolio Analysis: Drug Development Programs & Infrastructure Mechanisms

Award Category	Translational Awards	Total Active Awards	% Translational	TR Award Funding in FY04 ($M)
DDG	18	18	100%	$11.1
RAID	45	45	100	16.3
RAPID	19	19	100	3.1

Award Category	Translational Awards	Total Active Awards	% Translational	TR Award Funding in FY04 ($M)
P30*	54	61	88.5%	$212.5
R24	8	43	18.6	1.5
U24	8	14	57.1	6.0
Extramural Cores (P01, P30, P50)	1,165	1,364	85.4	N/A

*Only Comprehensive and Clinical Cancer Centers were included here, not the Basic Cancer Centers.

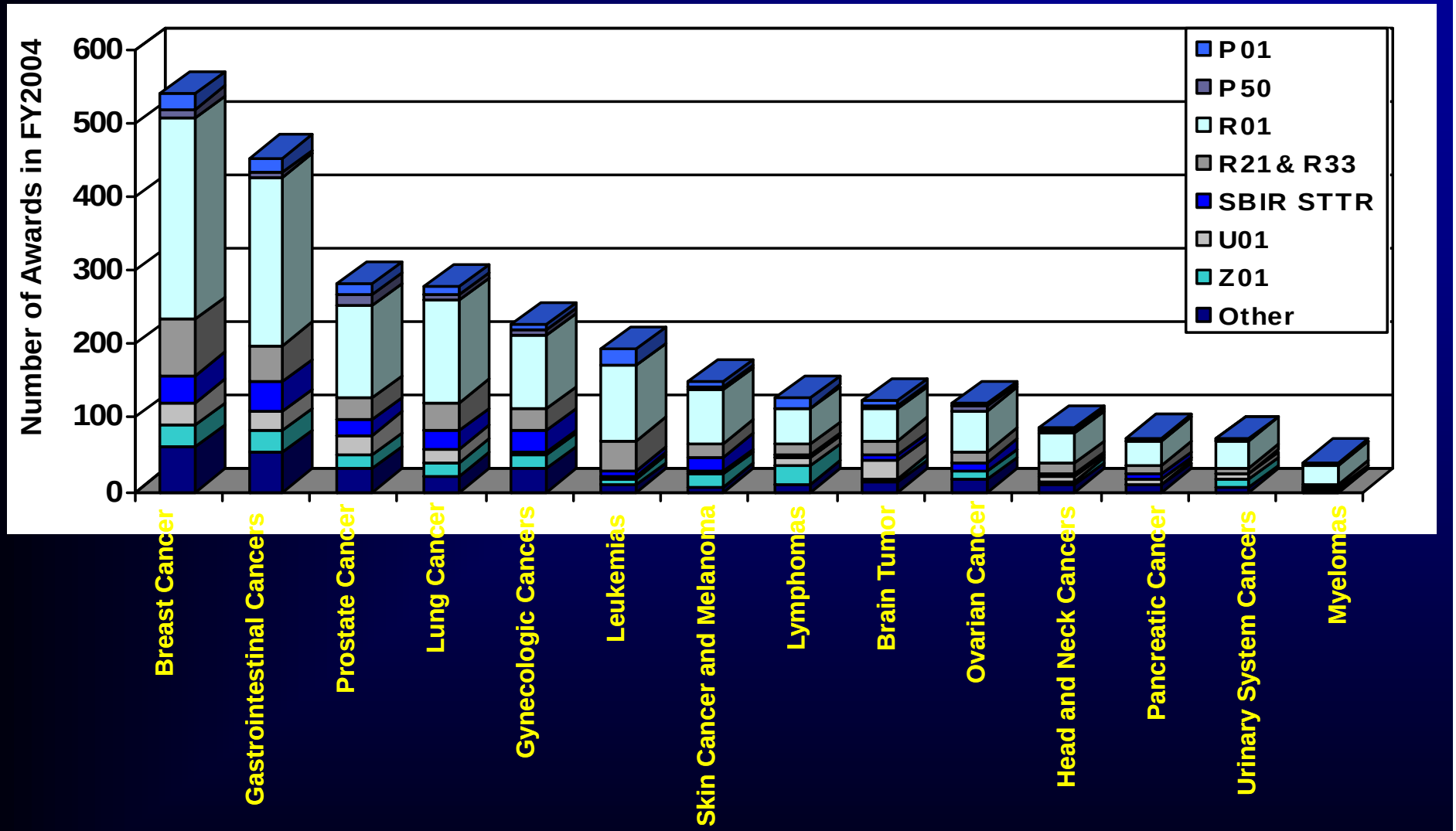
Portfolio Analysis: Individual Research, Small Business & Intramural Awards

Funding Mechanism	Translational Awards	Total Active Awards	% Translational	TR Award Funding in FY04 ($M)
R01	1,161	4,450	26.1%	$447.0
R03	150	320	46.9	8.1
R21	288	599	48.1	43.8
R33	62	121	51.2	24.2
R37	11	74	14.9	6.6
R41	28	42	66.7	4.7
R42	12	19	63.2	3.8
R43	87	246	35.4	13.3
R44	102	176	58.0	39.4
Z01	257	630	40.8	164.4
Totals*	2,789	7,933	35.2	1,330.4

*"Totals" show amounts for all Program and Cooperative Awards, Developmental Program Projects, Career Development Awards, Individual Research Awards, Small Business Awards, and Intramural Awards, & it excludes the amounts for the Infrastructure Mechanisms.

Total Number of Translational Awards in FY04

(>/= 25% Relevant to these Disease Sites)

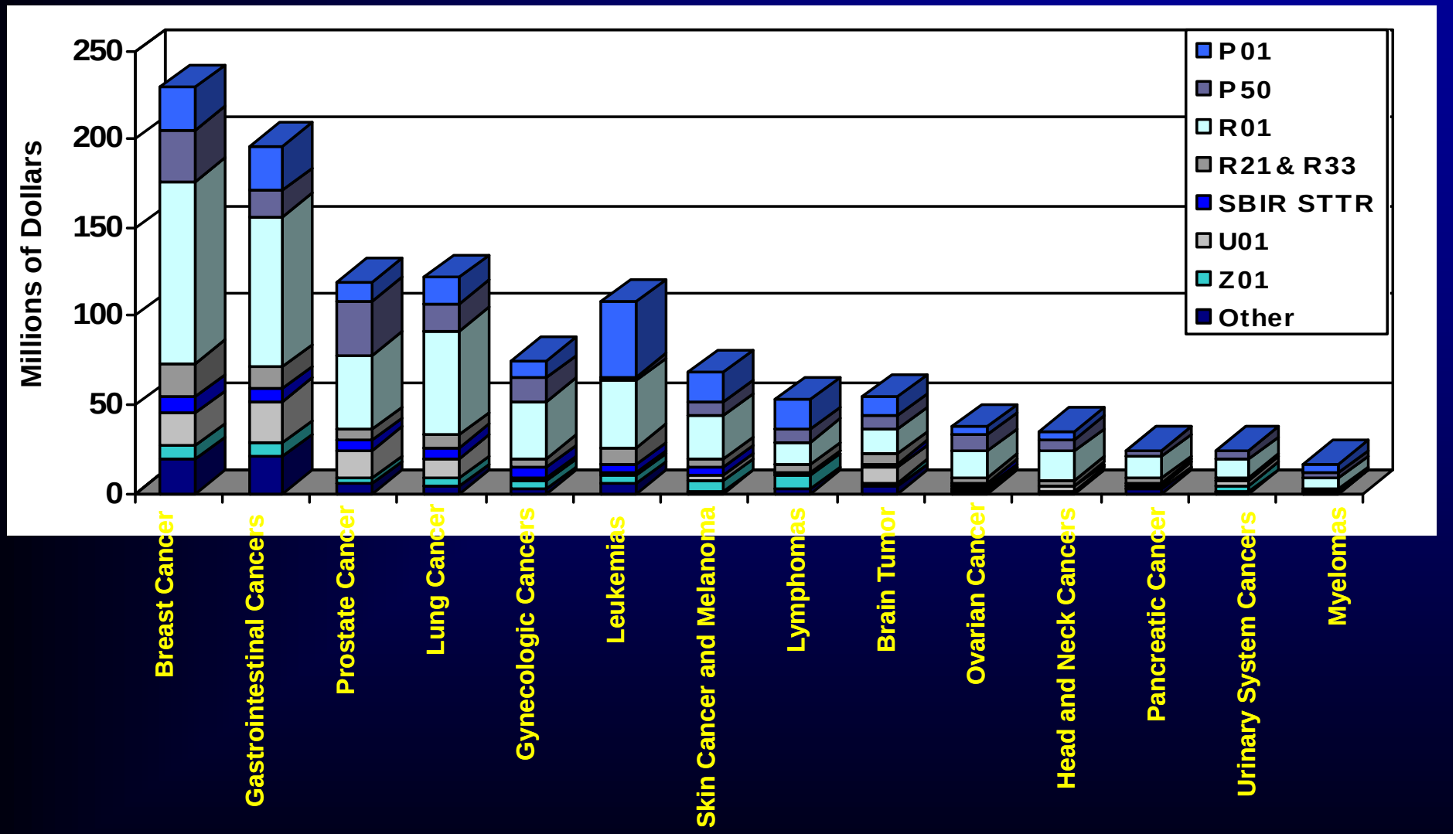


"Other" includes P20, P30, R03, R24, R37, U19, U24, U54, and U56 awards. K-series awards and U10 awards are not included.

www.cancer.gov/trwg

Total FY04 Spending for Translational Awards

(>/= 25% Relevant to these Disease Sites)

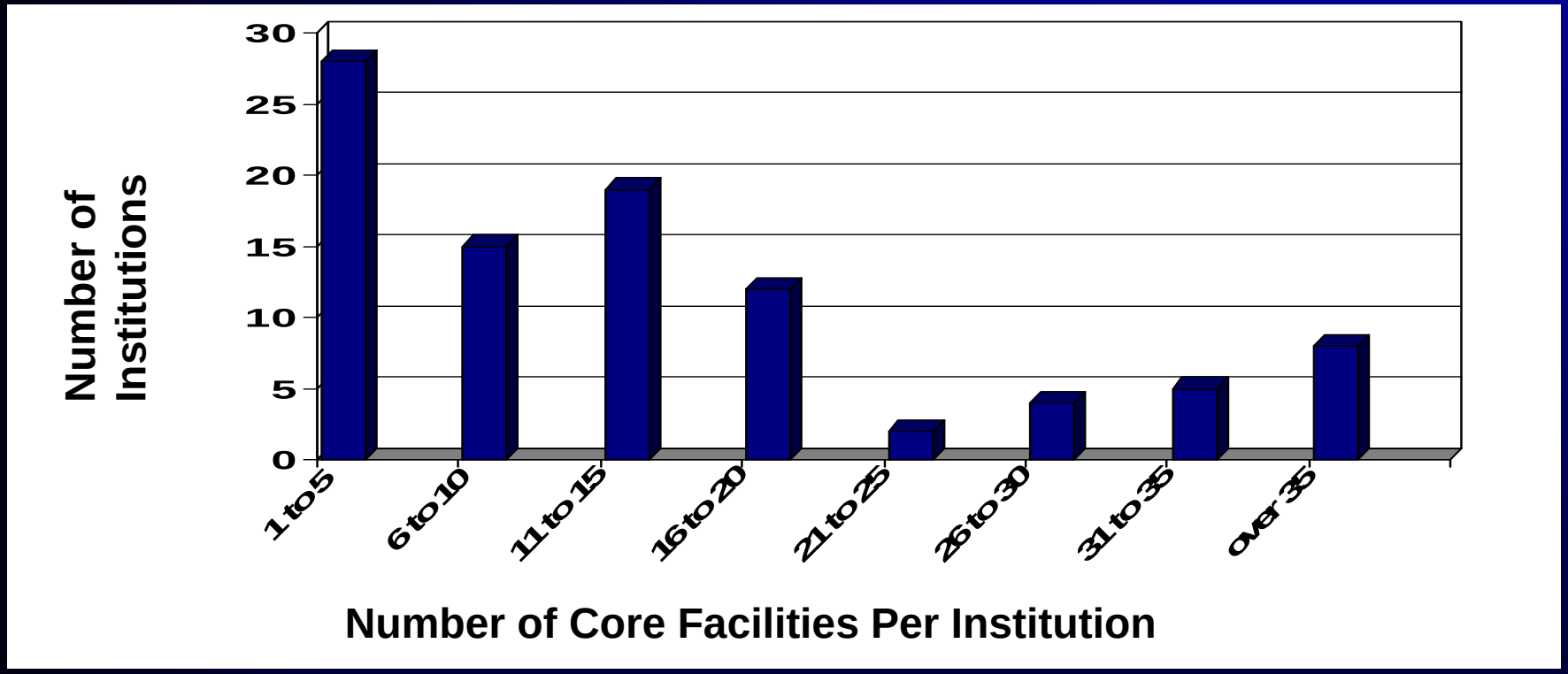


"Other" includes P20, P30, R03, R24, R37, U19, U24, U54, and U56 awards. K-series awards and U10 awards are not included.

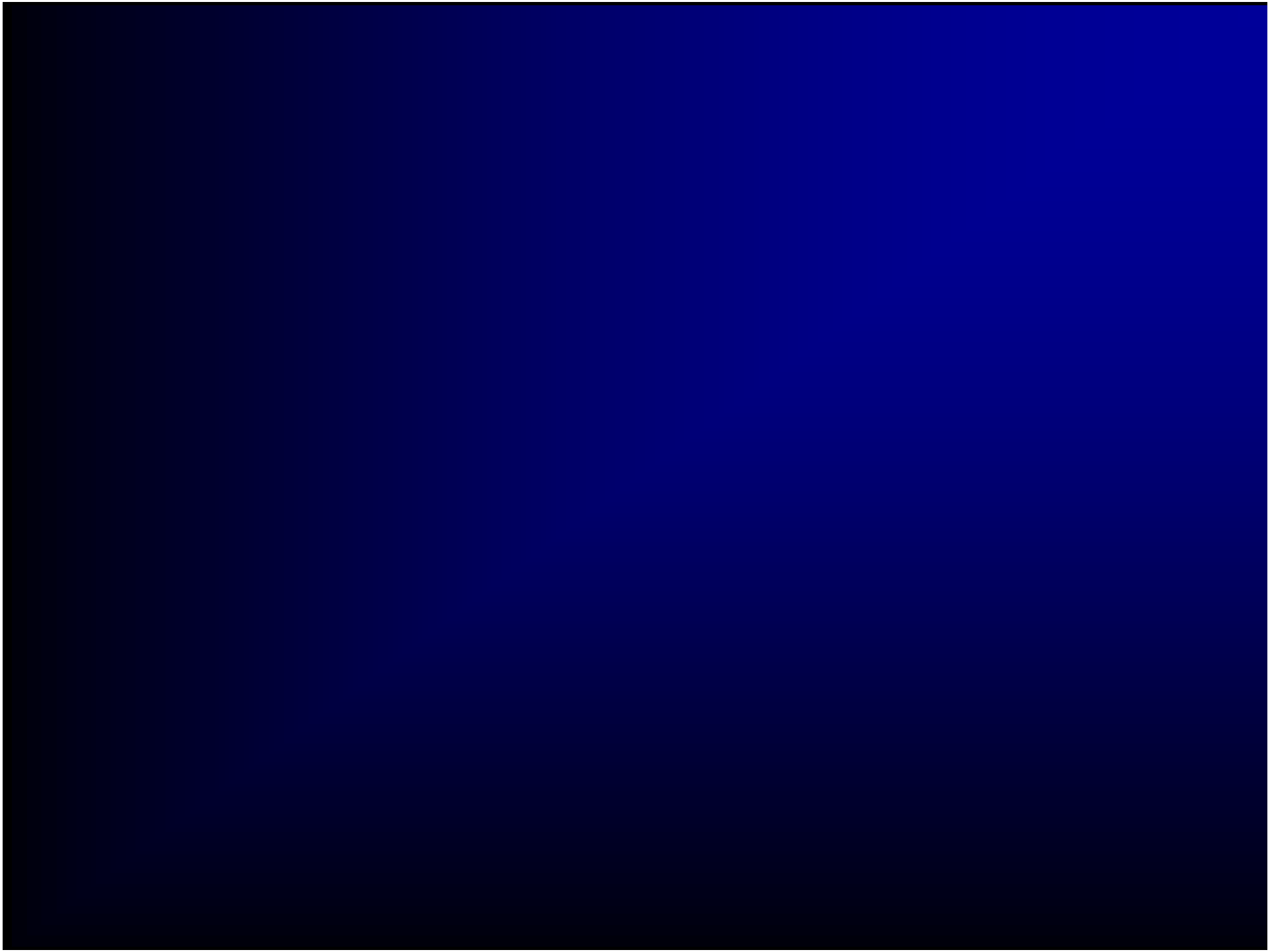
www.cancer.gov/trwg

Extramural Core Facilities Sponsored Through SPORE, P01, & P30 Mechanisms

Frequency Distribution



- Number of Core facilities includes all Basic, Clinical, & Comprehensive Cancer Center (P30) Core facilities, and all SPORE & P01 Core facilities identified from the SPORE website, CRISP database, and abstracts.



Drawing Inspiration from Pasteur

"To the individual who devotes his/her life to science nothing can give more happiness than when the results immediately find practical application. There are not two sciences. There is science and the application of science, and these two are linked as the fruit is to the tree."

Louis Pasteur, 1822-95