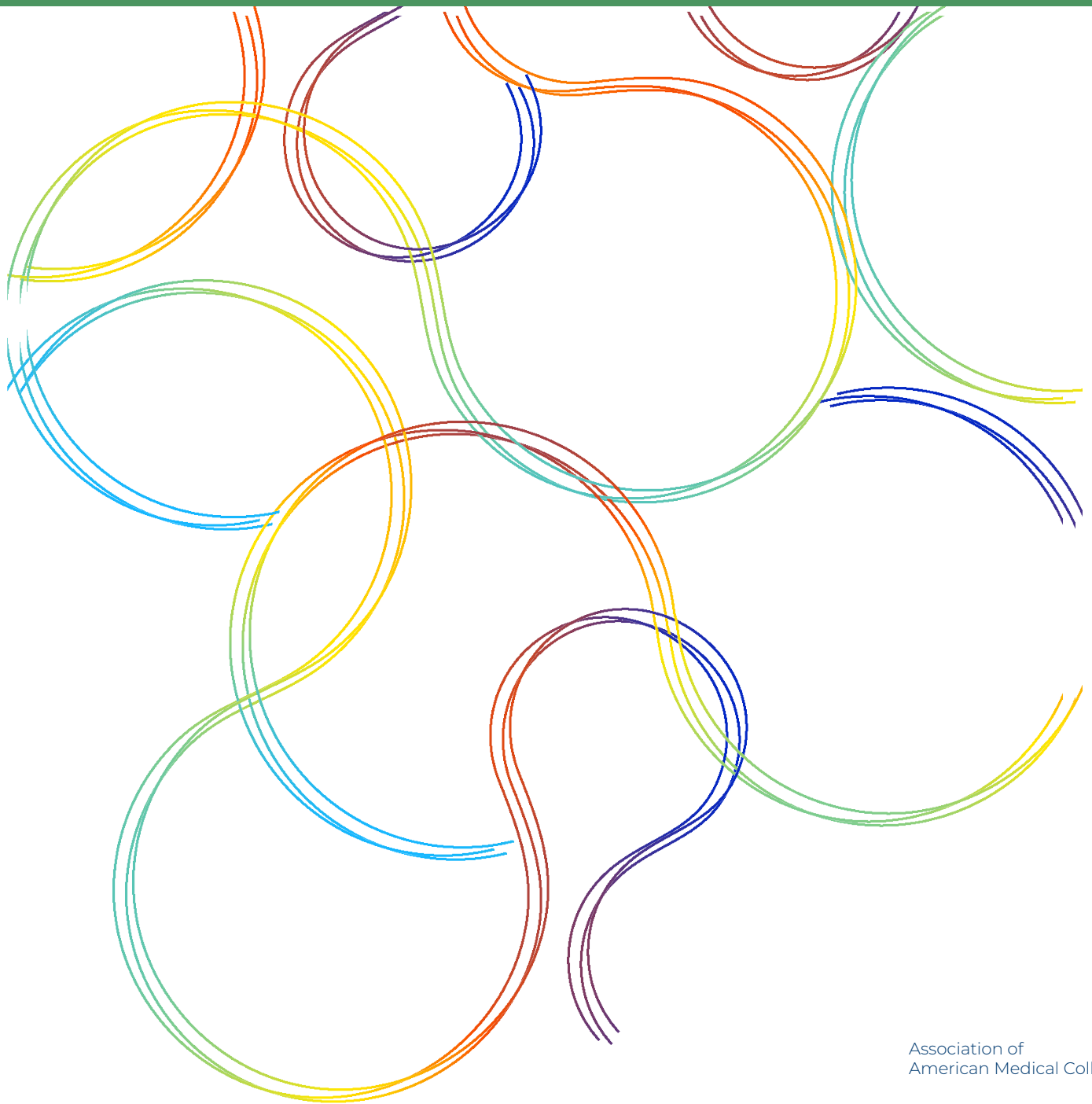




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# Exploring the Landscape for Physician-Scientist Training and Career Development

2024



## Exploring the Landscape for Physician-Scientist Training and Career Development

2024

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The AAMC regularly reviews its publications and educational materials to assess and adapt language as accepted usage continues to evolve. This document reflects the AAMC style guide at time of publication.

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## Executive Summary

### An Enduring Challenge: The Training and Support of Physician-Scientists in Academic Medicine

Physician-scientists, MDs or DOs who contribute to scientific investigation as a central part of their careers, are vital players in the biomedical ecosystem. Despite their irreplaceable role in advancing medicine, [declining numbers of medical students, early-career faculty, and residents are entering physician-scientist careers](#), and [the number of physician investigators funded by the National Institutes of Health \(NIH\) has been relatively flat over many years](#). Concern over the stability of the physician-scientist career path led the NIH in 2013 to establish the Advisory Committee to the Director Physician-Scientist Workforce Working Group to examine support for NIH-funded physician-scientists and related clinician-investigators. From this effort, an important concept emerged: the development of an institution-wide program, office, or network (deemed a “home”) that coordinates efforts among clinical department leaders; deans; and leaders in research, education, and faculty affairs to promote the advancement of early-career physician-scientists. Such homes would fill a crucial gap by providing structured scientific training, professional guidance, and career development for emerging and established physician-scientists.

### Project Conception and Charge

To close the gap between the conceptualization of these physician-scientist homes and the question of how to implement them at academic institutions, the AAMC established the Physician-Scientist Training and Career Development Home Project, guided by an external advisory committee. The committee’s charge included four main components (refer to Appendix B), and while the project addresses all the components (refer to the section, “Addressing the First Three Components of the Advisory Committee’s Charge”), the conclusions are primarily focused on the fourth component: identifying models of institutional physician-scientist homes that support physician-scientists in training and early-career faculty.

### Study Design and Institutional Home Models

In this report, we present case studies from 11 U.S. institutions, highlighting three distinct home models that utilize distinct mechanisms to accomplish the same end: improving collaboration across traditionally siloed departments to integrate their support for physician-scientists (PS) across diverse career stages and research disciplines. The models are:

- **Centralized (PS only):** Services and resources that are provided exclusively for physician-scientists are coordinated through a single, institutional entity that encompasses multiple career stages (e.g., medical students, early-career faculty), departments, and research disciplines.

- **Centralized (PS “plus”):** The institution uses a single, institutional entity to provide services and resources for all researchers, including but not limited to, physician-scientists (e.g., PhD researchers).
- **Distributed:** Services and resources for physician-scientists are not consolidated within a single, coordinating entity; they are instead accessed through numerous sources.

## Conclusions

- **The Definition of a Physician-Scientist Is Currently Too Narrow:** In contrast to the narrowly defined, traditional concept of the physician-scientist that is based on degrees obtained, NIH funding, and research being the primary professional activity, we urge studies to be inclusive of *all* physicians who conduct biomedical and behavioral research and to not be constrained by the amount of effort dedicated to research nor by the types of research being conducted.
- **Leveraging University Leadership and Partners is Crucial to Physician-Scientist Success:** Implementation of successful physician-scientist initiatives at all 11 institutions was preceded by robust, institutional commitment toward developing the physician-scientist infrastructure and workforce. Strategies to invest in the physician-scientist landscape often necessitated sustained conversations with institutional leadership (e.g., the school of medicine dean); buy-in from faculty across divisions and departments; and collaboration with campus partners, such as clinical and translational science institutes.
- **Institutions Leverage Early and Continuous Exposure to Research During Medical Training:** Most of the institutions we surveyed provided substantive research experiences for premedical students (an average of 90% of undergraduate students and 90% of postbaccalaureate students) and for all medical students, residents, and fellows. This early and continuous exposure to research may trigger a heightened interest in the research field among medical students in general (not just those in MD-PhD programs), which could increase the number of future physicians who engage in research.
- **Mechanisms to Support Those at Vulnerable Stages Along the Physician-Scientist Pathway Are Vital:** Transition periods between medical school and residency and from residency or fellowship to an early-career faculty position are “vulnerable” stages along the physician-scientist pathway that often lead to attrition; [the early-career faculty stage has a particularly high risk of attrition](#). Among NIH-funded principal investigators, [funding gaps are very common across all career stages](#). Our report identifies both institutional (refer to the section, “Institutional Profiles”) and broad (refer to the section, “Conclusions”) strategies and mechanisms to help support physician-scientists (e.g., bridge funding) and professional development of early-career physician-scientists (i.e., residents, fellows, and early-career faculty).
- **Diversity Is “Diverse,” Varying Widely Across Institutions:** In addition to broad mechanisms that promote diversity among physician-scientists, our study highlights the

importance of designing strategies, programming, and initiatives that are highly specific to each institution's diversity goals.

- **The COVID-19 Pandemic Brought Challenges and Unexpected Advantages:** The [broadly negative impact of the COVID-19 pandemic](#) on physician-scientist [productivity](#), [outcomes](#), and [early-career attrition](#) is well recognized. Despite the many detrimental impacts of the pandemic, institutional leaders noted that the use of virtual platforms made programs more accessible by democratizing the interview process. In addition, the pandemic allowed individuals with caregiving responsibilities to better balance personal and domestic priorities, and it drove institutions to leverage and embrace technology to promote productivity, efficiency, and community.

## Study Impact

This report is intended to serve as a resource for institutions that are seeking models and potential strategies to better support their physician-scientist learners and early-career faculty in navigating known barriers to their success.



## Introduction

Physician-scientists devote components of their professional careers to seeking new knowledge about health, disease, or delivery of patient care through research. As vital parts of the biomedical workforce, most physician-scientists investigate essential, clinical questions in a research-based environment and incorporate into patient care data-driven inquiry, connecting research to health by translating fundamental discoveries into novel diagnostics, treatments, and preventive medicine. In fact, physician-scientists represented [more than half](#) of Nobel Prizes awarded in physiology or medicine between 1997 and 2013.

Despite its inimitable role in biomedicine, the physician-scientist workforce has been the subject of national concern [for decades](#). A [declining share](#) of medical students, early-career faculty, and residents are entering physician-scientist careers, and [the numbers of NIH-funded physician investigators has been relatively flat over many years](#). More significantly, [a recent study](#) found that while the population of physician investigators supported across the NIH portfolio is stable, the average population is older than the general investigator pool.

Concern over the stability of the physician-scientist career path led the NIH in 2013 to establish an [Advisory Committee to the Director Physician-Scientist Workforce Working group \(PSWG\)](#) to examine support for NIH-funded physician-scientists and related clinician-investigators, who have been referred to as “[endangered species](#).” The federal initiative [highlighted a central conclusion](#) that early-career physician-scientists face a particular set of challenges distinct from those faced by other biomedical researchers: In addition to organization-level competition for resources, physician-scientists experience individual barriers, such as conflict between providing clinical care and service (to generate clinical revenue) and securing the protected research time required to establish a research career. As a response, the [PSWG recommended](#) increasing the proportion of NIH training grant fellowship awards for early-career investigators, expanding loan repayment programs for physician-scientists, leveraging the NIH Clinical and Translational Science Awards Program to promote early-career scientists, and utilizing institutional career development programs to meet the needs of physician-scientists.

The PSWG also asked for feedback from the research community and through a series of conversations with research deans from a few AAMC-member medical schools. From this feedback, an important concept emerged: the need for the development of an institution-wide program or “home” that coordinates efforts between clinical department leaders, deans, and leaders in research, education, and faculty affairs to promote the advancement of early-career scientists. Whether through a formal institutional office or some other coordinating body, these entities could provide structured, scientific training; professional guidance; and career development for emerging and established physician-scientists.

To close the gap between conceptualizing formal programs, offices, or networks (i.e., homes) as sources of support for physician-scientists and establishing such homes at academic institutions, the AAMC established the Physician-Scientist Training and Career Development Home Project with the following charge components (refer to Appendix B for more details):

- Define and consider the consequences of establishing a physician-scientist training and career development home.



- Identify key educational principles that all physician-scientists should obtain through training and career development.
- Identify the key institutional components for creating a home for physician-scientists in training and early-career faculty.
- Present several models to support physician-scientists in training and early-career faculty.

Though all components of the charge are important, most of the project's report findings are focused on the last bullet above: identifying models of institutional physician-scientist homes to support those in training and early-career faculty. In this report, we present case studies from 11 representative, U.S. institutions, highlighting three home models that utilize vastly distinct mechanisms to accomplish the same end: improving collaboration across traditionally siloed departments to integrate their support for physician-scientists across diverse career stages (e.g., students, early-career faculty, and established faculty) and research disciplines.

For the purposes of this report, the term “physician-scientist” refers to an individual with an MD, DO, or equivalent degree, who engages in basic, translational, or clinical research. It is crucial to note that while researchers with training in other health professions (e.g., dentists, nurses, etc.) are valued colleagues and collaborators, they were not the focus of this committee's charge. In addition, the amount of time that a physician-scientist dedicates to research was not a constraining factor in our definition; for example, two physicians — one who spends very little of their time on research and one who spends most of their time on research — would both be considered physician-scientists for the purpose of this study.

It is our hope that all institutions, regardless of their unique features (e.g., geography, student demographics and size, federal funding, etc.), can adopt components of this report for their needs. By modifying their institutional landscapes, we hope that academic medical centers can continue to complement national policies aimed at amplifying the growth and success of the physician-scientist workforce.

## Methodology

The Physician-Scientist Training and Career Development Home Advisory Committee, an external committee with expertise on the various stages of physician-scientist training and career development, provided guidance on all aspects of the study, including the selection of institutions involved in this initiative. The advisory committee met once in person and virtually several times to finalize its charge, complete the first three components of the charge, and develop the study questions for the institutions invited to share how they support physician-scientists in training and early-career faculty.

To learn about physician-scientist home models (the major focus of this project), we developed a 12-question, online survey (refer to Appendix C) and a script for conducting interviews with key institutional leaders. From this information, the advisory committee generated profiles of the institutions.

In total, 11 institutions were selected to participate in this study. Institutional teams were composed of 2 or 3 individuals, one of whom was responsible for gathering team input and completing the survey. Survey respondents had approximately two weeks to complete the survey and were encouraged to partner with other leaders across their institutions to obtain the required information. While diverse in many aspects (e.g., public and private infrastructure, geographic diversity, and federal research funding amounts), these institutions had implemented core components into their physician-scientist landscapes.

The survey included questions about core institutional components, including:

- Institutional priority and investment in the training and development of physician-scientists.
- Recruitment of physician-scientists for training leadership and faculty.
- The goals and scope of a home; evaluation of the measures of success for a program.
- Institutional buy-in.
- The physical components of a home (e.g., office space), its budget, and its resources.
- Formal and informal mechanisms of mentoring.
- Research opportunities and infrastructure.
- Training of physician-scientists.
- Diversity, equity, and inclusion.
- Career and professional development.

- Strategies for protecting research time.
- The unique contours of each institution (i.e., its “bright spots,” detailed in each profile).
- The impact of the COVID-19 pandemic on the institution.
- Suggested mechanisms (e.g., the institution’s “wish list”) to amplify the physician-scientist landscape institutionally.

The qualitative interviews were conducted with institutional teams within one month of completing the online survey. The interviews lasted 75-90 minutes on average and featured questions that aligned closely with the survey. The first four interviews were conducted between January and May 2023, after which the interview questions were slightly refined. The remaining interviews were conducted between October and December 2023.

All participants from each institution provided voluntary consent to engage in both segments of this study. To ensure accuracy, institutional representatives reviewed their respective profiles before publication. This study was reviewed by the AAMC Human Subjects Protection Program staff and was deemed exempt from institutional review board review.

## Addressing the First Three Components of the Advisory Committee's Charge

*Please refer to Appendix B for the full charge of the advisory committee.*

### **Defining and Considering the Consequences of Establishing a Physician-Scientist Training and Career Development Home**

The advisory committee considered the consequences (both positive and negative) of establishing physician-scientist homes for training and career development, which are outlined in the box below, “Defining and Considering the Consequences of Establishing a Physician-Scientist Training and Career Development Home.” Expected consequences would be the consolidation of resources (and elimination of duplication), standardization of metrics, and awareness of the “synergies” in programming. A significant consequence would be the demonstration of and communication by leadership that the institution highly values physician-scientists and is committed to their professional development. Relatedly, homes may serve to inspire mentoring cultures by connecting physician-scientists across career stages, departments, or other institutional units.

### **Identifying Key Education Principles That All Physician-Scientists Should Obtain Through Training and Career Development**

Despite the inevitable heterogeneity in physician-scientist homes (a consequence of each institution's unique qualities), the advisory committee set forth educational principles and career development skills that all homes should provide, while recognizing that the competencies of a physician-scientist (i.e., knowledge, skills, and abilities) change as they move across each career stage. Many individual units of institutions offer career and professional development resources, and programming should be shared and coordinated across departments and among institutions instead of being developed in silos. A list of the principles identified by the advisory committee is provided in the box below, “Identifying Key Education Principles That All Physician-Scientists Should Obtain Through Training and Career Development.”

## Defining and Considering the Consequences of Establishing a Physician-Scientist Training and Career Development Home\*

- Consolidate physician-scientist training resources to create:
  - Synergy between individual programs.
  - Common benchmarks, program evaluation metrics, and methods for tracking outcomes.
  - Efficiency by not needing to “reinvent the wheel.”
- Guide institutions to more strategically support physician-scientist training and career development, to:
  - Ensure continuity over time and institutional memory.
  - Increase competitiveness for grant funding.
- Demonstrate that the institution is committed to research conducted by physician-scientists to:
  - Raise the profile of physician-scientist education and career development within the institution.
  - Enhance recruitment and retention of diverse, early-career researchers.
  - Optimize the return on investment in physician-scientists.
- Ensure the formation of a physician-scientist community to:
  - Allow learning opportunities for physician-scientists to be more easily shared across the institution.
  - Address the current sense of isolation, especially at smaller institutions.
  - Support well-being and resilience.
  - Foster professional identity.
  - Facilitate peer-networking and the development of practice communities.
  - Increase internal review of grant applications prior to submission.
  - Ensure accessibility of career development activities.
  - Increase sharing of resources, processes, and other practices.
- Foster a mentoring culture to:
  - Create a pool of trained mentors.
  - Guide learner selection of mentors.
  - Facilitate development of mentoring networks that include near-peer and peer-peer mentoring.
  - Help prepare individuals for career transitions.

\* Edited for clarity.

## Identifying Key Education Principles That All Physician-Scientists Should Obtain Through Training and Career Development\*

- Gaining discipline-specific scientific knowledge, including:
  - Experimental and research skills.
  - The ability to translate and implement research findings to the clinic.
  - Knowing how to use and access available technologies.
  - Data science, statistics, computational, and other quantitative skills.
- Earning and maintaining clinical competencies, including:
  - Licensure.
  - Board certification.
- Producing rigorous and reproducible data.
- Maintaining responsible, ethical conduct and professionalism, including:
  - Avoiding possible conflicts of interest.
  - Abiding by research ethics.
- Maintaining wellness by:
  - Balancing clinical and research time.
  - Prioritizing time management to balance work time with personal time (e.g., learning when to say “no”).
  - Practicing resilience.
  - Hiring partners.
- Developing and maintaining professional networks.
- Demonstrating leadership and management skills, including:
  - Lab management.
  - Budget and finances.
  - Personnel management (e.g., recruitment).
  - Conflict management and resolution.
- Knowing how to communicate effectively through:
  - Grant writing.
  - Manuscript writing.
  - Oral communication.
  - Creating one’s own brand.
  - Targeted messaging.
  - Active listening.
  - Communicating across disciplines or specialties.
  - Negotiation.
- Prioritizing diversity and inclusion by:
  - Combating unconscious bias.
  - Fostering racial, ethnic, and cultural diversity.
  - Promoting all scientific disciplines or specialties.
  - Making room for diverse perspectives.
  - Encouraging inclusive community practices.

\* Edited for clarity.

*Continued on next page*

## Identifying Key Education Principles That All Physician-Scientists Should Obtain Through Training and Career Development (continued)\*

- Nurturing a mentorship culture by:
  - Providing mentorship training.
  - Being an effective mentee.
  - Providing sponsorship.
  - Offering peer and near-peer mentorship.
  - Identifying and interacting with mentors.
- Supporting career and professional development through:
  - Life-long learning.
  - Financial planning.
  - Planning ahead.
- Entrepreneurship and commercialization in research.

\* Edited for clarity.

## Identifying the Key Institutional Components of a Physician-Scientist Home

The advisory committee identified core components of a physician-scientist home, adding to and expanding upon the examples that were noted in the original charge; these components are listed in the box below, “Identifying the Key Institutional Components of a Physician-Scientist Home.” Among the key elements for the physician-scientist home, the committee envisioned the institution defining the scope and goals of the home, including which educational or career levels the home would support. In addition, the home would identify metrics for individual and program performances, on par with critical metrics used for individual departments; they would need to be straightforward or relatively easy to interpret, such as receipt of NIH funding or other awards. The institution would also work intentionally to generate buy-in from faculty and different parts of the organization, which would be critical for generating resources and support for the physician-scientist home. Any resources made available should be, in the committee’s view, “catalytic,” and be able to incentivize new revenues, similar to startup funds.

The advisory committee focused extensively on the career and professional development of physician-scientists, which it deemed especially important. A key benefit of establishing homes would be the development of mentor-established communities within particular specialties and across the institution that are available to physician-scientists at all stages. Relatedly, protected time for research, which the committee referred to as “the elephant in the room,” was deemed a perennial challenge in a physician-scientist’s development that must be addressed by physician-scientist homes. Protected time is ultimately supported by the clinical community, underscoring the need for community buy-in to the program.

Other topics for consideration included mechanisms for identifying future physician-scientists and the ability for a home to provide multiple avenues for students who are introduced to research



experiences both earlier and later in their journeys. The advisory committee believed that a key question remained in determining whether institutions were limited by their lack of resources or by their own “philosophies,” that is, their perceptions of the overall “value” of physician-scientists: What was limiting the financial allocation of resources that could help ensure the success of physician-scientists?

## **Identifying the Key Institutional Components of a Physician-Scientist Home\***

- Define scope and goals of a home.
- Identify career stages, departments, and disciplines to be supported.
- Identify, collect, and evaluate measures of success for individuals and programs.
- Generate institutional buy-in and resources.
- Get faculty support for recruitment and training of physician-scientists.
- Implement evidenced-based practices to achieve a diverse, equitable, and inclusive environment.
- Provide career and professional development resources and programs.
- Engage with critical partners to identify and disseminate approaches to provide protected time for research.
- Foster mentorship.
- Encourage community engagement, such as creating a database to identify, welcome, and connect members of the community.
- Identify and facilitate connections among key institutional partners.
- Develop a budget, and secure short- and long- term resources from the medical school and health system.
- Identify and implement programs and resources to support the health and well-being of physician-scientists.

\* Edited for clarity.

Collectively, all three aspects of the charge guided the study design detailed in the following sections.

## Physician-Scientist Home Models: Identification and Characterization

### Models Utilized by Surveyed Institutions: Definition and Characterization

Based on the 11 institutions in the study, models of physician-scientist (PS) homes for training and career development include:

1. The **centralized (PS only)** model.
2. The **centralized (PS “plus”)** model.
3. The **distributed** model.

In the **centralized (PS only)** model, services and resources that are provided exclusively for physician-scientists are mainly coordinated through a single entity that encompasses multiple career stages (e.g., medical students, early-career faculty), departments, and research disciplines. Frequently, this entity also engages in partnerships with other entities (e.g., clinical and translational science centers, academic departments) to support physician-scientists.

In contrast, the **centralized (PS plus)** model primarily utilizes a single entity to provide services and resources to all researchers (e.g., PhD researchers), including physician-scientists. Similar to the centralized (PS only) model, this entity frequently engages in partnerships with other entities and individual departments. Within the centralized (PS plus) model, variation occurs; for example, though both Ponce Health Sciences University School of Medicine and the University of Alabama at Birmingham Marnix E. Heersink School of Medicine utilize the centralized (PS plus) model, the former utilizes an institution-wide research institute for all biomedical researchers, while the latter utilizes an office that serves all research-focused clinician-scientists (e.g., dentists). It is also important to note that the nomenclature and structure of a single, coordinating entity varies by institution. For example, Duke University utilizes its office of physician-scientist development; Northwestern University Feinberg School of Medicine utilizes an umbrella structure that coordinates activities to unite those at various educational and career stages; and the University of Colorado School of Medicine utilizes a collaborative program across the institutional departments, centers, and institutes. It is also important to note that there are overlapping configurations between these various styles; however, in *all* cases of a centralized model, a single entity — which may even be based in a physical office — coordinates resources across a broad range of campus collaborators and partners, including [NIH Clinical and Translational Science Awards](#), MD-PhD programs, and cancer centers. Together, with other academic departments, clinical divisions, and community leadership, these coordinating entities collectively accomplish the goals of a physician-scientist home.

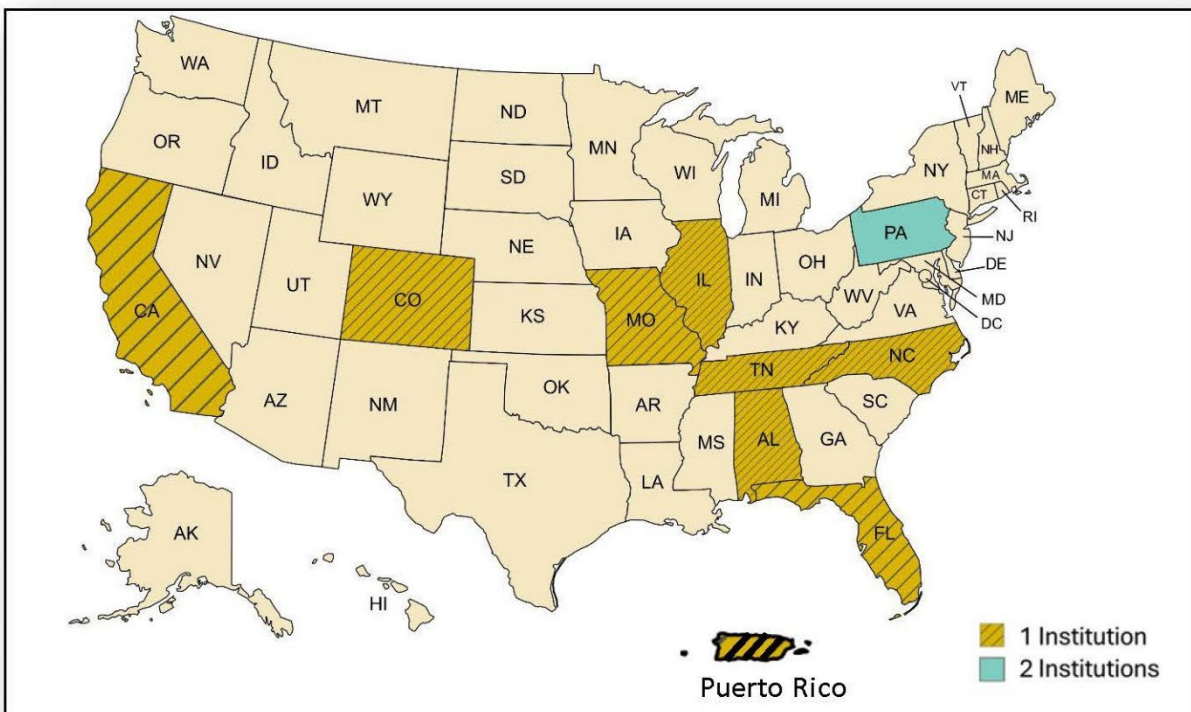
In a **distributed** model, services and resources for physician-scientist training and career development are distributed throughout separate entities within an institution, rather than being housed within a single, coordinating entity. In the distributed model, various entities have distinct functions; for example, targeting a specific career stage (e.g., medical students). It is important to note that institutions that utilize this model coordinate and integrate mechanisms across their campuses to train and develop physician-scientists across the career spectrum. Here, the main

difference from the centralized models lies in the fact that services and resources are not subsumed within a coordinating entity — they are accessed beyond the boundaries of a singular locus.

## Distribution of Models and Career Stages Across Surveyed Institutions

As seen in Figure 1, the selected institutions exhibit a wide geographic distribution, including the Northeast (n=2), South (n=4), Midwest (n=2), West (n=2), and the U.S. territory of Puerto Rico (the Ponce Health Sciences University [PHSU] School of Medicine, an LCME-accredited Hispanic-serving institution). Roughly one-third of the institutions in this study are public, and the remainder are private (Table 1). The numbers of faculty members, students, fellows, and residents represented by each institution are shown in Table 2.

[A 2017 study done by researchers at the Berkman Klein Center](#) highlighted disproportionate funding outcomes within the research community. To circumvent a bias in perspectives, our study design included institutions that represent a broad range of extramural NIH funding; thus, the analyses, data, and models presented in this report are derived from a diverse range of U.S. academic medical centers.



**Figure 1.** Distribution of surveyed institutions.

**Table 1. Model Distribution Among Surveyed Institutions**

Institution	Location	Type	Model
Duke University School of Medicine	Durham, NC	Private	<b>Centralized (PS only)</b>
Northwestern University Feinberg School of Medicine	Chicago, IL	Private	<b>Centralized (PS only)</b>
Penn State College of Medicine	Hershey, PA	Public	<b>Centralized (PS only)</b>
Perelman School of Medicine at the University of Pennsylvania	Philadelphia, PA	Private	<b>Distributed</b>
Ponce Health Sciences University School of Medicine	Ponce, Puerto Rico	Private	<b>Centralized (PS plus)</b>
University of Alabama at Birmingham Marnix E. Heersink School of Medicine	Birmingham, AL	Public	<b>Centralized (PS plus)</b>
University of California, San Francisco, School of Medicine	San Francisco, CA	Public	<b>Centralized (PS only)</b>
University of Colorado School of Medicine	Aurora, CO	Public	<b>Centralized (PS only)</b>
University of Miami Leonard M. Miller School of Medicine	Miami, FL	Private	<b>Distributed</b>
Vanderbilt University School of Medicine	Nashville, TN	Private	<b>Distributed</b>
Washington University School of Medicine in St. Louis	St. Louis, MO	Private	<b>Centralized (PS only)</b>

Source: [Blue Ridge Institute for Medical Research: Rankings of NIH Funding in 2023.](#)

**Table 2.** The Numbers of Full-Time Faculty Members (by Department Type and Degree), Residents and Fellows, and Medical Students at the Surveyed Institutions

Institution	Faculty, Basic Science			Faculty, Clinical			Residents and Fellows	Medical Students
	MD*	PhD†	MD and PhD‡	MD*	PhD†	MD and PhD‡		
Duke University School of Medicine	4	302	16	602	260	134	1,063	586
Northwestern University Feinberg School of Medicine	6	178	11	1,558	282	141	1,149	719
Penn State College of Medicine	4	148	11	828	165	74	693	649
Perelman School of Medicine at the University of Pennsylvania	5	245	21	2,388	456	374	1,193	782
Ponce Health Sciences University School of Medicine	8	19	3	153	2	1	27	684
University of Alabama at Birmingham Marnix E. Heersink School of Medicine	38	182	19	1,028	272	100	1,054	812

# Exploring the Landscape for Physician-Scientist Training and Career Development

2024



University of California, San Francisco, School of Medicine	<b>15</b>	<b>105</b>	<b>17</b>	<b>1,813</b>	<b>406</b>	<b>380</b>	<b>1,327</b>	<b>849</b>
University of Colorado School of Medicine	<b>70</b>	<b>228</b>	<b>24</b>	<b>2,780</b>	<b>829</b>	<b>184</b>	<b>1,166</b>	<b>782</b>
University of Miami Leonard M. Miller School of Medicine	<b>15</b>	<b>115</b>	<b>7</b>	<b>1,056</b>	<b>233</b>	<b>78</b>	<b>1,098</b>	<b>888</b>
Vanderbilt University School of Medicine	<b>9</b>	<b>107</b>	<b>8</b>	<b>1,525</b>	<b>301</b>	<b>166</b>	<b>1,049</b>	<b>441</b>
Washington University School of Medicine in St. Louis	<b>3</b>	<b>171</b>	<b>14</b>	<b>1,460</b>	<b>563</b>	<b>361</b>	<b>1,305</b>	<b>625</b>

\* MD or DO degree only or an equivalent degree.

† PhD degree only or other doctoral degree.

‡ Both MD and PhD degrees or MD degree and other doctoral degree ("MD" includes DO and other equivalent degrees).

This table does not include faculty members with other or unreported degrees. Please note that not all of the medical schools listed in the table are the sponsor institutions for the residents or fellows (e.g., Duke University Hospital is the sponsor, not Duke University School of Medicine.)

Source for faculty data: [AAMC Faculty Roster](#), December 31, 2023, snapshot, as of June 30, 2024.

Source for student and resident data: AAMC. [FACTS: Applicants, Matriculants, Enrollment, Graduates, MD-PhD, and Residency Applicants Data](#). AAMC; 2023; Table B-1.2: Total Enrollment by U.S. MD-Granting Medical School and Gender, 2019-2020 through 2023-2024.



Analysis of the distribution of home models can provide insight into both current and ideal mechanisms for promoting physician-scientist training and career development. Of the 11 surveyed institutions, 55% (n=6) utilize the centralized (PS only) model, 18% (n=2) utilize the centralized (PS plus) model, and 27% (n=3) utilize the distributed model. Six centralized (PS only) institutions and one centralized (PS plus) institution (University of Alabama at Birmingham Marnix E. Heersink School of Medicine [UAB Heersink SOM]) support physician-scientists in the residency and fellow stages, and 86% of these institutions support early-career, physician-scientist faculty (Figure 2). In addition, of the seven institutions in Figure 2, most provide resources to support physician-scientists throughout their undergraduate (86%) and medical school (86%) education. By contrast, only a quarter of institutions provided resources for established investigators.

	Undergraduate Student	Medical Student	Resident	Fellow	Early-Career Faculty	Midcareer Faculty	Established Faculty
Duke University School of Medicine	●	●	●	●	●		
Northwestern University Feinberg School of Medicine			●	●	●	●	●
Penn State College of Medicine	●	●	●	●	●	●	
University of Alabama at Birmingham Marnix E. Heersink School of Medicine	●	●	●	●			
University of California, San Francisco, School of Medicine	●	●	●	●	●		
University of Colorado School of Medicine	●	●	●	●	●	●	●
Washington University School of Medicine	●	●	●	●	●		

**Figure 2.** The career stages represented at centralized (PS only) institutions and University of Alabama at Birmingham Marnix E. Heersink School of Medicine (a centralized [PS plus] institution).

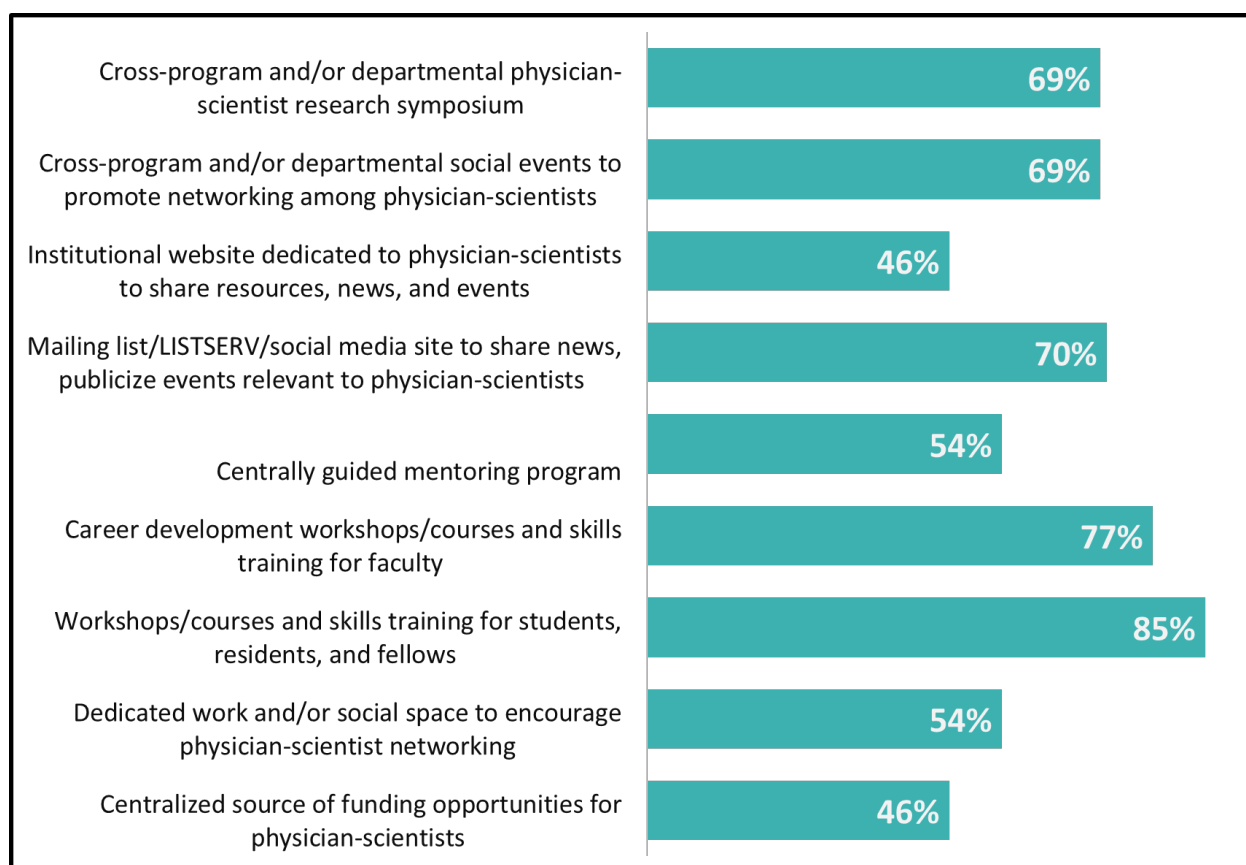
Our data highlight that current physician-scientist homes have two primary functions:

1. To provide support and resources to help mitigate possible challenges at vulnerable points along the physician-scientist pathway, including the transition between training and attaining an early-career faculty position (and the early-career faculty stage itself).
2. To help expose undergraduate and medical school students to early and continuous research experiences to foster the “physician-scientist mindset.”



Training and career development workshops for students, residents, fellows, and early-career faculty are among the most offered resources among all 11 surveyed institutions (Figure 3); a notable lack of dedicated resources for established faculty within most homes, however, suggests that these faculty utilize resources available to all campus researchers (e.g., the office of research grants and contracts) and may need additional resources targeted to their career stage. Consistent with these data, and as detailed in the project charge (refer to the section, “Addressing the First Three Components of the Advisory Committee’s Charge”), the advisory committee deemed it prudent to define and consider the consequences of establishing a home, and to identify the core components of a home and fundamental educational principles.

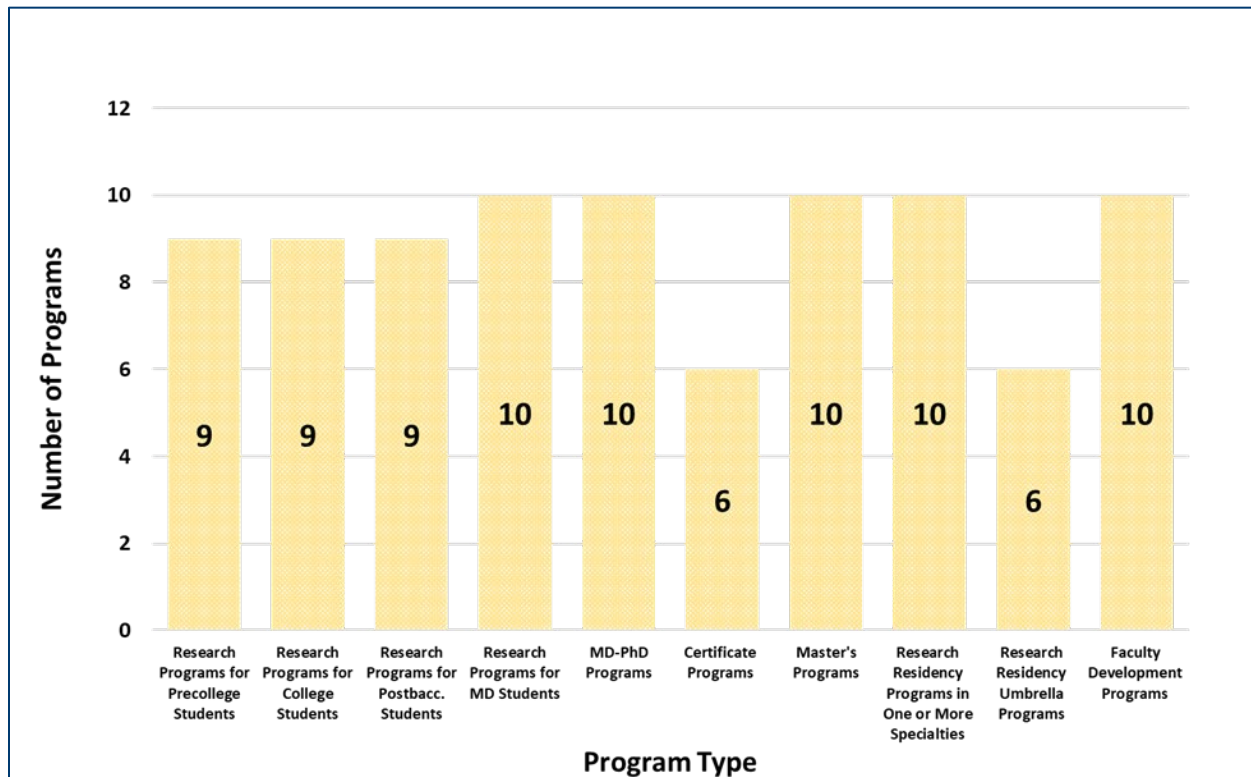
Based on our data, common sources of funding for the operation of centralized (PS only) institutions and UAB Heersink SOM were institutional grants and departmental funds. The average number of full-time employees was three individuals, and the average budget per program or office was \$1.3 million, with a median of \$1.5 million.



**Figure 3.** Institutional components for supporting physician-scientists along the training and career pathway.

## Fostering the Entry and Retention of Physician-Scientist Researchers

Consistent with our finding that most institutional, physician-scientist homes support the learner stage and that all homes support the residency and fellow stages, institutions also indicated a wide range of research-related programs for early and aspiring physician-scientists. As seen in Figure 4, a total of nine separate institutions (N=10; one institution was not included in this dataset due to its organizational structure being deemed an outlier in this group) provide research programs for precollege, college, and postbaccalaureate students. In addition to an MD-PhD program, all institutions provide research programs for MD students who are not pursuing secondary degrees in research.



**Figure 4.** The landscape of institutional research programs for aspiring or early-career physician-scientists.

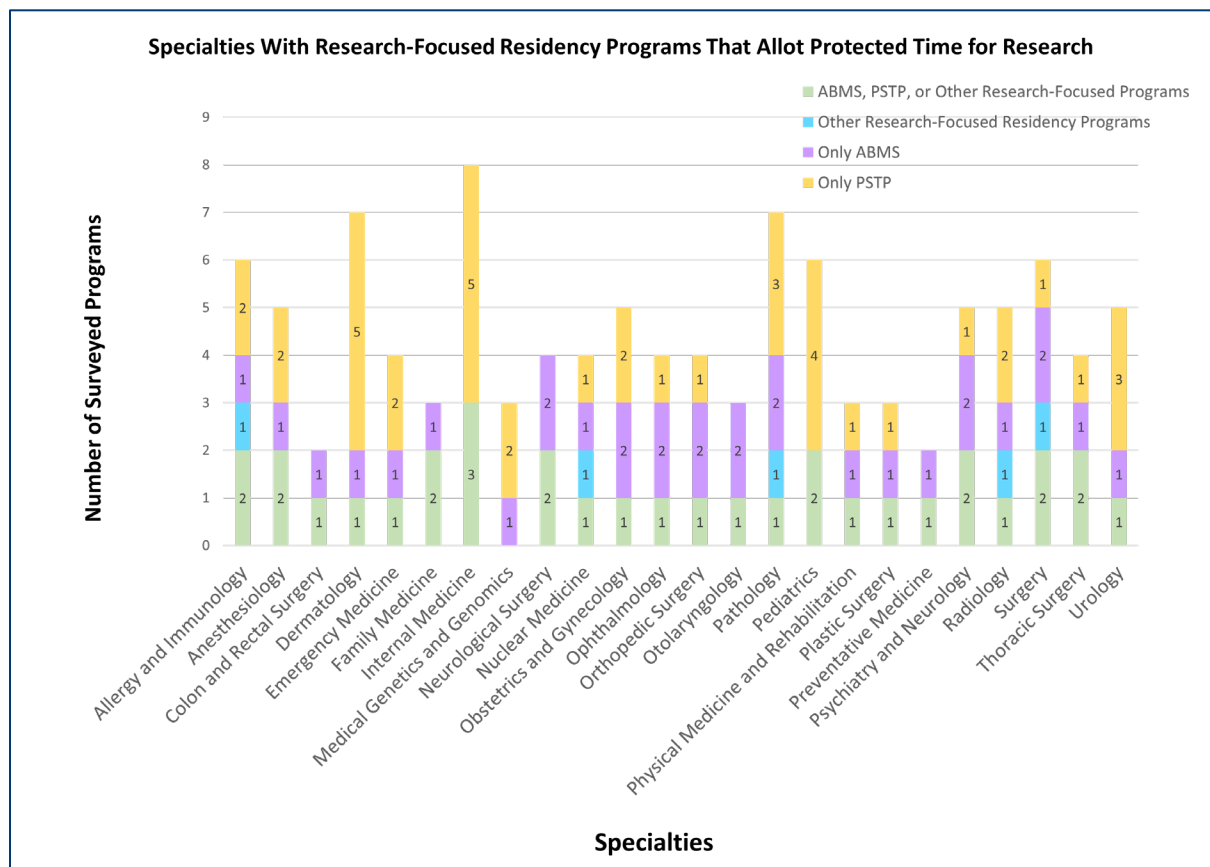
Though all institutions provide research residency programs in one or more specialties, the number of institutions utilizing research-residency umbrella programs are markedly lower (n=6). As shown in Figure 5 (n=9; two institutions were not included in the dataset), many institutions offer residency programs focused on research training, including American Board of Medical Specialties research residency programs, physician-scientist training programs, and other analogous programs that allot protected time for research in residency. Our data indicate that the

# Exploring the Landscape for Physician-Scientist Training and Career Development

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specialties with the highest number of such programs are internal medicine (n=8), dermatology (n=7), pathology (n=7), allergy and immunology (n=6), pediatrics (n=6), and surgery (n=6). Institutions had, on average, five research residency programs, with the median being 4.5 programs. To close the gap between obtaining research training and integrating research discovery as a stable component of one's career, all institutions (n=9) provide faculty development programming for early-career physician-scientists (Figure 4).



**Figure 5.** Specialty-specific programs focused on physician-scientist research training, including American Board of Medical Specialties (ABMS) programs and physician-scientist training programs (PSTPs).

## Conclusions

Below are the condensed takeaways that reflect key, qualitative information gained from our study.

### ✓ **The Definition of a Physician-Scientist Is Currently Too Narrow.**

This report seeks to be inclusive of *all* physicians who are doing research. Our interviewees, likewise, felt that the definition of a physician-scientist should not be constrained by the amount of time one dedicates to research nor the type of biomedical or behavioral research they do (e.g., basic vs. translational). In fact, [recent data](#) suggests that a much larger portion of physicians report being actively involved in research (14%) than what is typically estimated (1%-2%) for the more narrowly defined population of physician-scientists; these estimates are traditionally based on NIH funding, degrees obtained, or self-reports of research being the primary professional activity. For the purposes of data analysis and policy recommendations, however, it is crucial to define the precise population that one is referring to when the term “physician-scientist” is used, given that various populations have distinct professional needs.

### ✓ **Leveraging University Leadership and Partners Is Crucial to Physician-Scientist Success.**

A feature that preceded the implementation of successful physician-scientist initiatives at all 11 institutions was robust institutional commitment toward the development of the physician-scientist infrastructure and workforce. As detailed in the “Institutional Profiles” section of this report, formalized strategies and plans to invest in the physician-scientist landscape often necessitated sustained conversation with institutional leadership (including the school of medicine dean), buy-in from faculty across divisions and departments, and collaboration with campus partners, such as clinical and translational science institutes. Beyond financial resources, our interviewees stressed the importance of building a culture that views investment in research and physician-scientists as also an investment in clinical care and the overall health mission of the institution. It is important to note that even well-resourced institutions require dedicated financial resources to support the training and career development of physician-scientists, especially lab-based scientists. Regarding long-term success of physician-scientist initiatives, our interviews revealed that assessment and evaluation are equally as important as implementation, as assessments and evaluations inform which areas need to be modified or receive investment.

### ✓ **Institutions Leverage Early and Continuous Exposure to Research During Medical Training.**

Most surveyed institutions provide substantive research experiences for premedical students (an average of 90% of undergraduate students and 90% of postbaccalaureate students) and for all

medical students, residents, and fellows (Figure 4). In fact, many surveyed institutions include scholarly research experience as a mandatory component of their undergraduate medical education curricula. This early and continuous exposure to research may trigger a heightened interest in research among medical students, not just those in MD-PhD programs; in turn, positively impacting the future generation of physicians engaged in research.

## ✓ **Mechanisms to Support Those at Vulnerable Stages Along the Physician-Scientist Pathway Are Vital.**

“Vulnerable” periods — those with high risk of attrition — [have been identified at all career stages along the physician-scientist career pathway](#), and [funding gaps are very common at all career stages for NIH-funded principal investigators](#). In particular, transition periods between medical school and residency, and from the resident or fellow stage to the early-career faculty stage, are considered vulnerable stages for physicians engaged in research; [particularly, the early-career faculty stage](#). Our report highlights institutional strategies and mechanisms (detailed in the “Institutional Profiles” section) that are being used successfully to support physician-scientists. In addition, the following broad strategies were noted by interviewees:

- **Obtaining institutional commitment:** Institutional leadership that prioritizes the integration and buy-in of residency directors (key stakeholders who determine the residents’ time commitments) serves to better make the case for the importance of protecting the time required for residents to make research progress amidst clinical demands.
- **Having protected research time:** Residents who dedicate time for research may leave a gap in their clinical demands, which in turn causes departments to find additional resources. In addition to institutional investments, institutions also utilize external grants (e.g., [the NIH Stimulating Access to Research in Residency \[StARR\] program](#), [NIH Research Career Development \[K\] awards](#), and the [Burroughs Wellcome Fund Physician-Scientist Institutional Award \[not currently offered\]](#)) to help fund residents who are dedicating their time to research. These funds enable early-career physician-scientists to establish their independent research careers, while allowing departments to take on additional residents to cover clinical needs. There remains concern whether this model can be implemented in departments with fewer residents, so there is still the need for additional models to be explored.
- **Investing in the researcher:** Current review criteria for awards given for physician-scientist career development often value first-author publications, a criterion also used for early-career PhD researchers. In contrast to these PhD researchers, however, early-career physician-scientists often begin their research careers during clinical training and, therefore, require more time to secure a publication or successfully obtain a funded grant. Career development awards reserved for physician-scientists can account for this differential by “investing in the researcher.”
- **Supporting life transitions:** Many surveyed institutions revealed that they experience loss of those on the physician-scientist pathway during life transitions that prevent continuous



research productivity (e.g., caregiving and pregnancies). To mitigate this loss, our interviewees recommended the implementation of institutional support (e.g., bridge funding) that could be used to mitigate compromised research progress.

- **Having mentorship programs throughout a career:** Though many institutions offer mentoring programming for distinct professional stages, our data indicate a lack of mentoring programming that spans a physician-scientist's career. Institutions are encouraged to ensure targeted mentoring for specific career stages (e.g., residents) and across all departments and medical specialties, while recognizing that some mentoring needs may vary by discipline.

## ✓ **Diversity Is “Diverse,” Varying Widely Across Institutions.**

Biomedical research progress relies on “team science”: the ability to collaborate and cross-pollinate beyond individuals, research teams, fields of study, techniques, and institutions. In fact, research shows that diverse teams outperform homogenous teams in terms of [research quality](#) and [problem-solving](#). As [defined by the NIH](#) and corroborated by our study, diversity is not a homogenous mission, but rather, it represents a wide range of institutional priorities. Oftentimes, such priorities are geared at amplifying the representation of groups that have been traditionally underrepresented in biomedicine. Over the course of our study, we found that the unique needs of an institution's local population have greatly influenced the institution's strategy for fostering diversity; for example, UAB Heersink SOM is deeply invested in providing medical care to its rural population, which comprises more than 46% of the state population. By contrast, the PHSU School of Medicine in Puerto Rico focuses its diversity efforts on being a steward for research activities and relief efforts for the local island community. In addition to broad mechanisms that promote diversity among physician-scientists, our study highlights the importance of designing strategies, programming, and initiatives that are highly specific to each institution's diversity goals.

## ✓ **The COVID-19 Pandemic Brought Challenges and Unexpected Advantages.**

The COVID-19 pandemic had [major impacts on the biomedical research ecosystem](#), including a widespread decrease in [research productivity](#) and a [disproportionate impact on various groups within the academic medicine workforce](#) (e.g., [women caring for young children](#)). Despite the detrimental health, societal, and workforce consequences of the pandemic, institutional leaders noted unexpected positive outcomes:

- Many medical schools and graduate programs utilized online video platforms, such as Zoom, for their admissions interviews, thereby reducing the financial burden typically associated with onsite interviewing and helping to democratize the interview process by making programs more accessible.
- The dramatic increase in hybrid work that followed the pandemic has allowed individuals with caregiving responsibilities to better balance personal priorities and competing domestic needs.

- Institutions were driven to leverage and embrace technology to promote productivity, efficiency, and community.

Collectively, these conclusions represent the features and nuances that can guide institutional efforts to support the development of physician-scientists.



## Institutional Profiles

## Duke University School of Medicine

Home model: centralized (PS only)

**Institutional Commitment:** Though research has always been a top priority at Duke, in 2018 Dean Mary E. Klotman, MD, established a school-wide [office of physician-scientist development \(OPSD\)](#). This high institutional commitment to form and support this office, along with the efforts of key faculty who started innovative programs, would have an enduring effect on the physician-scientist landscape at Duke. The OPSD now serves as a centralized hub that provides integrated research during clinical training, career development programs, and structured and tailored mentoring. Services are provided for a diverse population, from medical students to the early-career faculty stage. A preprogram development survey, which was distributed to individuals in training and faculty across the training spectrum, was pivotal in determining the programmatic priorities of the office, as well as mechanisms that would make the physician-scientist career track more attractive. Rather than viewing physician-scientist training and development as “one size fits all,” Duke differentiates and accounts for the unique contours inherent to different types of research. For example, Duke considers the investment in lab-based scientists to be of utmost importance, given the strong financial challenges of lab-based research.



### BRIGHT SPOT

*Within the institution, Duke’s leadership has popularized the phrase, “Train at Duke, stay at Duke.” Duke has a culture built on the rationale that it is more financially sound to invest in the career development of Duke-trained physician-scientists, rather than rely solely on the ability to attract and pay “high-profile” recruits. As a result, the rate of the research-in-residency training participants who stay at Duke for fellowship training is close to 80%.*

**Creating a Home for Physician-Scientists:** Because of Duke’s OPSD (among other features), the institution frequently serves as a sounding board for other institutions inquiring about the feasibility (financial, operational, etc.) of establishing a centralized resource for physician-scientist training and development on their own campuses. Leadership reports that, within the immediate Duke community, the office has buy-in from all 16 clinical departments, with monetary contributions and “in-kind” human resources from clinical departments and the dean’s office. While the majority of physician-scientists are in clinical departments, many clinical faculty also have secondary appointments in a basic science department, further increasing the sense of community participation. Duke also uses networking, social events, and the annual physician-scientist symposium to build community among those at all levels.

The office coordinates the following programs and resources for physician-scientist training and development:

- **Integrated research training programs:** During medical school, residency, and fellowship (as well as a merit-based support award for technicians and research assistants), these programs enable continuity of research during clinical training.
  - Duke's [Medical Scientist Training Program \(MSTP\)](#), an NIH-funded program conducted under the auspices of the Graduate School of Duke University and the Duke University School of Medicine, trains highly qualified students as MD-PhD physician-scientists. Among the 50 such programs funded by the NIH, the MSTP was the fourth program established by the NIH in 1966.
  - All major departments at Duke have physician-scientist training programs (PSTPs), including surgery, medicine, pediatrics, neurosurgery, psychiatry, head and neck surgery and communications sciences, radiation oncology, and family medicine. Duke's OPSD works collaboratively with the PSTPs to coordinate research in residency training pathways, including four NIH [StARR R38](#) programs accessible to 50% of Duke clinical departments; a good example is the [Duke Pediatric Research Scholars Program](#), the department of pediatrics' PSTP that identifies and trains the next generation of pediatric physician-scientist leaders. This program focuses on the period of transition from residency and fellowship training to an academic appointment.
- **Scholarships and research funding:** Duke's OPSD offers a range of funding opportunities to medical students, early-career faculty stage, and those at stages in between. These opportunities include the Burroughs Wellcome Fund (BWF) Medical Student Scholarships for Research Years; Poindexter Medical Student Scholarships for Research Years; BWF Scholarships for the Master of Health Sciences Degree, Basic Science Research Track; OPSD Technician Support Awards; and Physician-Scientist Early-Career Faculty "Strong Start" Awards. Notably, Duke's [Physician-Scientist "Strong Start" Award program](#) provides early-career faculty award recipients with \$75,000 annually for three years to support their research programs. Since 2017, 31 recipients have been awarded a total of \$6 million.
- **Tracks for Research Engagement:** The OPSD provides lists of programs, funding, scholarships, and other learning opportunities to students, residents, fellows, and early-career faculty. These resources (refer to the links below) are funded by the NIH (e.g., StARR grants), BWF, Doris Duke Charitable Foundation, American Heart Association, and Duke.
  - [Duke OPSD opportunities for undergraduates](#)
  - [Duke OPSD opportunities for postbaccalaureates](#)
  - [Duke OPSD opportunities for medical students](#)
  - [Duke OPSD opportunities for residents](#)
  - [Duke OPSD opportunities for fellows](#)
  - [Duke OPSD opportunities for early-career faculty](#)

**Mentorship and Career Development:** Duke requires a structured mentoring committee at the departmental [PSTP](#) level, comprised of input from the division chief, chair of the department, the candidate, and the primary mentor. At the OPSD level, Duke provides "tailored supplementary mentoring," especially for those in smaller departments that may not have the critical mass for

their own mentoring programs. Professional development series are also offered for medical students, residents, fellows, and early-career faculty.

**Metrics of Success:** Metrics of success vary between the various departmental PSTP programs. The OPSD, however, has a logic model in place for short- and long-term evaluations.

### **Wish List for Future Implementation:**

- Duke boasts a high level of institutional commitment for physician-scientist training and development. The institution will continue to work toward making the programs sustainable.
- Currently, tracking of career outcomes exists solely at the departmental level, rather than at the school of medicine level. Duke hopes to establish an all-encompassing database that would include medical students, residents, fellows, and faculty, to collect crucial data on mentorship, programming, and career outcomes.

### **Interviewees:**

- **Gowthami Arepally, MD:** Professor of Medicine, Professor of Pathology, Associate Director of the Office of Physician-Scientist Development.
- **Rasheed Gbadegesin, MD:** Wilburt C. Davison Distinguished Professor of Pediatrics; Professor of Medicine; Associate Dean for Physician-Scientist Development; Director of the Office of Physician-Scientist Development.

## Northwestern University Feinberg School of Medicine

Home model: centralized (PS only)

**Institutional Commitment:** An explicit goal of Northwestern University Feinberg School of Medicine (Feinberg) is to train future leaders of academic medicine. As such, the university has a rich history and strong, national reputation for investing in physician-scientists who are active in basic and clinical research. Notably, Feinberg has benefited from a continuous culture of physician-scientist support that has perdured throughout changes in leadership, and its deans and other institutional leaders have been exceptionally committed to hiring physician-scientists as department chairs. A large portion of the current clinical department chairs at Feinberg identify as physician-scientists, who in turn recruit physician-scientists in their departments. Remarkably, almost half of the researchers at Feinberg are physicians, with the other half comprising PhD researchers.

**Creating a Home for Physician-Scientists:** Northwestern's physician-scientist landscape has been shaped by institutional leadership, who have recognized the ability to develop physician-scientists as a feature that distinguishes the institution from other national institutions. Feinberg utilizes an umbrella structure — which includes [The Starzl Academy](#) and the [Medical Scientist Training Program](#), which you can read more about below — as the centralized home for physician-scientist training and development. Established in 2020, this structure coordinates training activities and unites members across various career stages of their training, all the way up to the early-career faculty level.

Below is a list of coordinated programming that supports the development of physician-scientists and promotes research training:

- The Starzl Academy serves as an umbrella over [PSTPs](#) across Feinberg's several clinical departments. Feinberg's PSTPs are specialized programs designed for transition from residency or fellowship to a full-time academic position as a physician-scientist. Northwestern's department of medicine has the largest PSTP, with robust PSTPs in other clinical departments, such as pediatrics and surgery. The academy also coordinates a program that has two dedicated investigator positions (at the resident and fellow levels) for individuals who belong to populations that are traditionally underrepresented in medicine. These positions are supported financially by the dean, with the intention that these individuals will transition into the faculty after completing two years of research.
- The [Medical Scientist Training Program \(MSTP\)](#), an MD-PhD program that receives NIH MSTP grant support, brings in approximately 17 candidates each year and was one of the first sites in the nation to receive NIH support. The program, which has seen an approximately 30% increase in students over the past decade, despite an overall decrease in Feinberg's class size, represents a major institutional commitment that deans have historically used discretionary funds to support. The MSTP is cofunded through the dean's office and an endowment that is dedicated to ensuring that finances are not a barrier to training (e.g., the availability of moving allowances and emergency funds).

- To encourage all medical students to engage in research, Feinberg offers the [Area of Scholarly Concentration program](#). This program allows students to engage in a highly mentored, independent research project over the four years of their medical school training; students who wish to pursue additional research can apply for research internships that serve as a “fifth year.” About a quarter of medical students choose to apply for these internships. The [Research Intensive Scholarly Emphasis program](#) provides an opportunity for students to spend an extra, funded year of mentored research during their training.
- For assistant and associate faculty at Feinberg, the [Northwestern University Leadership Education Advancement Program](#), is an academic-year-long program that provides the opportunity to develop as a cohort of emerging leaders, such as center directors, fellowship directors, and division chiefs. This program, which selects approximately 20 faculty with MD, MD-PhD, or PhD degrees, provides resources for personal growth, financial understanding and management, leadership development, decision-making, and administrative skills. Specific programming for early-career faculty includes a monthly conference that helps new physician-scientists and investigators build community and become acquainted with resources. The faculty are selected through an application process that includes a support letter from the chair and a narrative from the applicant describing their leadership needs and how the program can help their career trajectory.
- Feinberg recently received a grant from the NIH Common Fund’s [Faculty Institutional Recruitment for Sustainable Transformation program](#), which has enabled the creation of the program, [Northwestern University Recruitment to Transform Under-Representation and Achieve Equity \(NURTURE\)](#). NURTURE allows for the cohort-based recruitment of individuals who represent communities underrepresented in research in the areas of cancer; cardiovascular and metabolic health; and brain, mind, and behavior. Of note, Northwestern has also recently appointed an associate dean for faculty (housed in the office of institutional diversity and inclusion), who works closely with the vice dean of faculty affairs. This new leader has also developed programming for faculty who represent communities underrepresented in medicine, as well as collaborated closely with department chairs to identify a vice chair who can act as a liaison and champion inclusion and diversity.

**Mentorship and Career Development:** All stages along the physician-scientist training and development pathway benefit from a strong institutional prioritization of mentoring and career development, especially early-career faculty. Every faculty member who is appointed through Feinberg has a dedicated mentoring committee that includes a senior faculty lead, who serves as chair and advises on the identification of additional committee members. Though there is variability among departments regarding committee structure, the committees are highly specialized and tailored to the needs of recruited faculty. Regarding career development, a special seminar series for NIH Research Career Development (K) awardees and coordinated through the Northwestern University Clinical and Translational Sciences (NUCATS) Institute, provides individuals with feedback on research and career programming for a successful transition to independent funding. Lastly, a novel [grant writing coaching group approach](#),



spearheaded and refined by the associate dean for faculty recruitment and professional development, offers highly effective tools for the conceptualization, design, and writing of both career development (K) and research (R) grants.

**Metrics of Success:** All the programs described above are assessed using a Northwestern term, *metrics of academic success*. These metrics (e.g., grants, publications, mentees obtaining leadership roles) are shared with faculty, chairs, and directors of both major institutes and centers as key performance indicators for faculty progression and as a mechanism for benchmarking against other institutions. In addition to these quantitative metrics of academic success, faculty and leadership have dedicated time (e.g., an annual seminar) to engage in important dialogue that centers around important questions, such as, “Are we using the right metrics?” and “What is the trajectory of such metrics?” Retention of faculty, which remains high, is another metric of success valued at Northwestern.



## BRIGHT SPOT

*“Most of our clinical department chairs are physician-scientists themselves. It’s easier to then recruit physician-scientists when the person doing the recruitment has that same experience: [being] a physician-scientist and an actively funded investigator. Our recruitment of [physician-scientist] chairs who in turn recruit [physician-scientist] faculty is a real bright spot. This allows us to build our culture.”*

— Rex Chisholm, PhD

## Wish List for Future Implementation:

- More dedicated research space.
- Growth in the proportion of residents and fellows on the physician-scientist pathway. This would necessitate an investment to ensure physician-scientists have protected time for research and don’t feel pressure to generate as much clinical revenue as those who are not engaging in research.

## Interviewees:

- **Rex Chisholm, PhD:** Adam and Richard T. Lind Professor of Medical Genetics, Associate Vice President for Research, Vice Dean for Scientific Affairs and Graduate Education.
- **Alan Hauser, MD, PhD:** Professor of Microbiology-Immunology and Medicine, Vice Chair of the Department of Microbiology-Immunology, Director of the Medical Scientist Training Program.
- **Ben Singer, MD:** Lawrence Hicks Professor of Pulmonary Medicine; Associate Professor of Medicine, Biochemistry, and Molecular Genetics; Director of the Physician Scientist Training Program within the Department of Medicine.
- **Farzaneh Sorond, MD, PhD:** Dean Richard H. Young and Ellen Stearns Young Professor of Neurology, Director of the Simpson-Querrey Center for Neurovascular Science, Vice Dean of Faculty Affairs at Feinberg.



## Ponce Health Sciences University School of Medicine

### Home model: centralized (PS plus)

**Institutional Commitment:** Ponce Health Sciences University (PHSU) serves as a community-wide beacon for driving not only research and scholarship, but public health and regional innovation. Over the past few decades, PHSU has established an advanced research infrastructure, transforming from a primarily medical education and graduate education institution into a vigorous scientific research center. This shift has positively impacted PHSU's physician-scientists, who are approximately 10%-15% of the PHSU research workforce. Though PHSU School of Medicine (SOM) has no formal physician-scientist training and career development umbrella program, Ponce Research Institute (PRI), an affiliated non-profit entity that provides research infrastructure support for the university, serves as a coordinating umbrella structure for all researchers, including physician-scientists. PHSU serves as an excellent model for harnessing the infrastructure of a centralized research engine (in this case, PRI) to advance physician-scientist development at all stages.

**Creating a Home for Physician-Scientists:** To create a home for physician-scientists, PHSU School of Medicine utilizes the PRI, which serves as the research arm of the university. PRI acts as an umbrella that provides strategic oversight for all aspects of research, including grants management, professional development seminars and workshops, regulatory practices (including the institutional review board), and financial streams (e.g., allocating seed money to new recruits, salary supplementation for faculty). Though not exclusive to physician-scientist training, PRI establishes partnerships with academic departments to codirect physician-scientist recruitment, development, and programming. Funding for research is centralized through the PRI and is supported by the clinical trial unit and clinical and diagnostic lab revenue. Funds are, in turn, allocated to academic departments to promote research activities.

It is important to note that, because PHSU is a relatively small institution, leadership puts a significant deal of effort into fostering team science that transcends departments and research areas (e.g., public health, psychology). Moreover, a high degree of collaboration and continuity between the PRI's research advisory committee and academic departments led to the joint development of a research strategic plan that meets the needs of the individual academic departments and those regarding institutional research. Additionally, faculty recruitment is coordinated jointly by PRI and academic departments; thus, although physician-scientists are recruited into individual departments, their research progress and support remain tightly tethered to the PRI, which provides the following programs and resources for physician-scientist training and development at PHSU School of Medicine:

- PHSU utilizes a longitudinal curriculum that integrates required research for all medical students. In addition to the research itself, the comprehensive research curriculum includes research seminars and professional development workshops, allowing students to adopt a "physician-scientist mindset."
- PHSU coordinates a paid summer research experience for first-year medical students, placing interested scholars at sites throughout the island. This program allows students to engage in research beyond the direct PSHU community.

- To promote professional development and research dissemination, PHSU coordinates a yearly scientific conference for medical students and residents (approximately 500 attendees).
- PHSU supports 16 research residency programs across a variety of specialties. To coordinate professional development activities (e.g., workshops), PRI has hands-on engagement and frequent communication with their respective research coordinators at residency sites (e.g., affiliated hospitals).
- PRI coordinates programming and research experiences for early-career physician-scientists and a wealth of research infrastructure and support for all research faculty (e.g., grants, budgets, institutional review board).
- PRI coordinates with the H. Lee Moffitt Comprehensive Cancer Center and Research Institute (U54CA163071), the NIGMS-funded [Graduate Research Training Initiative for Student Enhancement program](#) (T32GM144896), the [Research Centers in Minority Institutions](#) (U54MD007579), and the [PHSU Specialized Center in Health Disparities](#) to run a research seminar series that is open to all biomedical researchers on campus.
- Along with two other academic medical and health sciences centers in Puerto Rico, PHSU has a collaborative grant, [The Hispanic Alliance for Clinical and Translational Research in Puerto Rico](#) (U54GM133807), that supports an island-wide program dedicated to clinical and translational research. One of the aims of the alliance is to provide professional development activities to enhance the abilities of early-stage investigators to develop competitive clinical and translational research programs that emphasize the health needs of Hispanic communities.

**Mentorship and Career Development:** PRI coordinates career development for physician-scientists along the career spectrum. Coordinated with PHSU School of Medicine, activities include a formal mentoring program (detailed below), workshops, and seminars. Though activities are open to all, they are specifically targeted to medical students, residents, fellows, and early-career faculty. The PRI's centralized office of research support assigns all newly recruited physician-scientist faculty with an administrative assistant, budgetary support, and support for establishing their research labs. To provide physician-scientists with dedicated time for discovery, PHSU relieves new faculty from teaching for their first 18 months; after which, the teaching load is gradually increased. Because most classes at PHSU School of Medicine are team-taught, teaching time is relatively minimal for physician-scientists, as compared to what is often found at undergraduate institutions. Regarding mentorship, PHSU School of Medicine also coordinates a formal mentoring program in which early-career faculty are paired with senior mentors to help them navigate the institution, receive guidance on research and teaching, and better understand the contours of professional advancement (e.g., portfolio preparation for annual evaluations). In addition, formal mentoring programs embedded within grants (e.g., the [NIH Research Centers in](#)

[Minority Institutions Program](#) at PHSU) ensure that the success of mentees is monitored and documented.

**Metrics of Success:** PRI tracks progress through a variety of factors. To gauge how the growth of the research enterprise has grown, the institution tracks longitudinal outcomes of research activity (e.g., presentations, grants submitted, papers, traditional metrics). Financial assessments are also crucial to gauge the development of the research enterprise; specifically, the number of dollars being allocated from PRI to PSHU School of Medicine and the dollar amounts of research awards coming into PRI (e.g., growth from \$6.5 million to more than \$20 million over 10 years). In terms of engagement for students (e.g., MD students), scholars (e.g., postdocs), and faculty, PRI tracks metrics on the summer research program (the number of students who apply, the number of those accepted, etc.); the number of faculty in PHSU School of Medicine who are active mentors; and the number of early-career physician-scientists who are engaged in research.

#### Wish List for Future Implementation:

- Supplementary funds for PHSU School of Medicine would allow growth in the following areas: recruitment (e.g., putting together a competitive package for a top-tier recruit), outreach (e.g., integrating high school students in research), and investing in pertinent research areas as outlined by the university's strategic plan (e.g., quantitative sciences, big data, artificial intelligence).
- A commonly used mechanism to allocate funds for research growth is through an endowment, which PHSU does not currently have. The development of an endowment fund is a future objective that will allow continued growth in the aforementioned areas.



#### BRIGHT SPOT

*Community partnership is the backbone of PHSU and the PRI. The institution is viewed by the community as a pillar for service, support, and relief efforts. Fundamentally, all PHSU research activities are geared toward improving the local community. During the COVID-19 pandemic, PHSU partnered with the local department of health to become a nucleus for pandemic-related research activity (e.g., conducting the sequencing that identified COVID-19 variants, providing lab equipment and supplies). PHSU also has a mentoring program that pairs research faculty with community leaders to develop joint research projects that address the needs of the community. This deep connection with the community defines PHSU. A pillar of the island, PHSU has the largest clinical trial unit in Puerto Rico (over 25 therapeutic areas). Due to the trust and partnership with the community, PHSU clinical trials are extremely active and representative of the population.*

#### Interviewees:

- **Vanessa Rivera-Amill, PhD:** Associate Dean of Biomedical Sciences, Scientific Director of Inno Diagnostics Reference Laboratory at Ponce Research Institute, Professor at Ponce Health Sciences University.
- **Kenira Thompson, PhD, MBA:** President of Ponce Research Institute, Vice President for Research at Ponce Health Sciences University.

## Penn State College of Medicine

Home model: centralized (PS only)

**Institutional Commitment:** Physician-scientists' efforts at Penn State College of Medicine (PSCM) are primarily focused on two vulnerable developmental phases: transitioning from medical student to resident and from resident to early-career faculty. In 2015, the university launched the Physician-Scientist Recruitment Initiative to address the need for more institutional physician-scientist expertise to guide the faculty training of those who teach MD-PhD students. This initiative was pivotal in the formation of several key investments:

- The development of a fund to provide partial start-up funds for physician-scientists.
- A “matching effort” that provides extra protected time for physician-scientists to work on current and future projects.
- The creation of the associate dean for physician-scientist development role.

Crucially, this initiative — which also included the formation of the centralized office of [Physician-Scientist Development](#) — has been successful, because of the vested community interest to actualize this vision. At the first meeting to discuss the formation of a physician-scientist training program, institutional leaders “couldn’t fit everyone in the room.”

Penn State’s physician-scientist landscape harnesses collaboration across a range of interdisciplinary centers, institutes, and departments; for example, the university’s [Clinical and Translational Science Institute \(CTSI\)](#) is an independent, NIH-funded, multidisciplinary center that provides a program for physician-scientists of various stages (refer to the bulleted list below). Cross-pollination is also fostered at PSCM by ensuring that basic scientists hired into clinical departments also have a secondary appointment in a basic science department. Physician-scientists are likewise encouraged to become training faculty in adjacent graduate programs. Additionally, PSCM has a program in which basic scientists can shadow physicians working in the clinic, and clinicians can shadow basic science lab meetings.

**Creating a Home for Physician-Scientists:** Penn State has a distinct investment in the development of physician-scientists during the early (and often vulnerable) career stages. This is evidenced in the extraordinary number of pragmatic resources that are available to residents, fellows, and early-career faculty. Regardless of career spectrum, the centralized office serves as a welcoming home for [all Penn State physician-scientists at various career stages and across disciplines](#), providing them with an overview of institutional support and exposing them to training, coaching, and mentoring. Notably, PSCM boasts an umbrella [Physician-Scientist Training Program \(PSTP\)](#) for residents and fellows that encourages collaboration and interdisciplinary research among early-career physician scientists (refer to the Bright Spot).

Below are programs and resources for physician-scientist training and development at Penn State:

- As noted above, PSCM has an NIH-supported MD-PhD program, the [Medical Scientist Training Program \(MSTP\)](#), which trains undergraduate medical students as physician-scientists.
- The MSTP sponsors an early-exposure, foundations program in which two to four undergraduate students from Penn State Schreyer Honors College engage in clinical shadowing and research to gain a deeper understanding of the physician-scientist career pathway.
- The CTSI, in coordination with the centralized physician-scientist office, offers an NIH-funded [Translational Research Training Program](#) that allows graduate (PhD) and medical students (MD-PhD) to acquire the knowledge and skills needed to conduct interdisciplinary clinical and translational research. The CTSI also directs an experiential summer translational science fellowship to provide graduate and medical students with skills in research design, data analysis, communications, ethics, and teamwork.
- The [PSTP](#) provides research training and mentoring for undergraduate students and those in graduate medical training, MD candidates with research focus, as well as residents and fellows in research pathway programs (refer to the Bright Spot). Notably, this program serves as a community and forum for peer and near-peer mentoring, as well as faculty engagement. The PSTP at Penn State is unique in that it has learners at various stages interacting and learning broadly applicable research topics.
- The [Junior Faculty Development Program \(JFDP\)](#) is a program geared toward promoting success of early-career faculty (not exclusive to physician-scientists) at PSCM and Penn State Health Milton S. Hershey Medical Center. An eight-month program, the JFDP consists of both a comprehensive curriculum of weekly lessons and an individual project completed under the guidance of a senior faculty member assigned by JFDP leadership.
- The PSCM research development office, which supports the research needs of faculty at all levels, focuses a considerable amount of effort on the physician-scientist workforce (e.g., helping to find funding opportunities, secure their first grant, and organize mock grant review sessions).



## BRIGHT SPOT

*A unique feature of Penn State's physician-scientist landscape is its [Physician-Scientist Training Program \(PSTP\)](#). Rather than offering a traditional program siloed by departments or divisions, this PSTP is an institution-wide umbrella program made up of 48 residencies and 25 fellowship programs. This overlapping of scholars across different programs facilitates cross-pollination of ideas, collaboration, and interdisciplinary research. The PSTP is open to residents and fellows from all departments, who have specific research paths, as determined by their program directors. The program provides individual-mentored research activity as well as biweekly seminars and workshops on research resources, mentoring, and professional development. Notably, PSTP scholars form an interdisciplinary mentoring team of three faculty members to help guide their development.*



- The Penn State [Clinician-Scientist Faculty Mentoring \(FaMe\) Program](#), conducted through PSCM, is a two-year program designed to help early- and mid-career practicing clinicians (including physician-scientists) build community, obtain protected time for mentoring, and engage in scholarly and career advancement activities. FaMe is open to both early-career clinician-scientists, as well as senior faculty (associate and full professors), who are interested in pursuing extramurally funded, basic/translational or clinical research. The unique approach of the FaMe program is equal representation of lab-based (“traditional”) clinician-scientists who have more than 50% of protected research time and clinical investigators with predominantly clinical duties (“non-traditional” clinician-scientists who have no more than 50% of protected research time). “Non-traditional” clinician-scientists are typically not included in other types of mentoring programs, such as the JFDP.
- The CTSI, in coordination with the central physician-scientist development office, offers the [Early-Stage Investigator Training Program](#) (funded in part through the NIH) that provides early-career to mid-career faculty with the coursework, mentored research, and career development resources needed to become successful, independent, clinical and translational scientists. The funding for this program provides 75% protected time for research, funds for research supplies, tuition support for up to three courses per semester, and travel. All full-time early-career faculty at Penn State with a research or practice doctorate (i.e., MD, DO, PhD, MD-PhD, PharmD, DrPH, DO-PhD, or comparable doctoral-level degree) at the rank of assistant professor are eligible to apply.

**Mentorship and Career Development:** Penn State’s commitment to mentoring and career development can be evidenced in a myriad of investments. On a cultural level, PSCM has a mentoring academy that provides public recognition for good mentors, as well as mentoring awards. The institution also relies heavily on near-peer mentoring to help researchers at various stages. In addition, PSCM recently launched the [FaMe](#) program, a two-year program designed to prepare, mentor, and build community among physicians and other clinical health providers who are conducting clinical, translational, or basic research. The program of approximately 20 early-career faculty includes weekly protected time for research training and alternates a lecture and scholarly advancement time every other week. During scholarly advancement time, FaMe scholars review the didactic sessions from the previous week and engage in additional reading related to that topic. FaMe includes intensive [grant writing programs](#); emerging technology seminars; career development seminars; and presentations by students, residents, and fellows. Relatedly, the [JFDP](#) serves as a competitive, year-long program that helps early-career faculty understand the complexities of being an academic faculty member (e.g., how to teach, how many committees to participate in, how to start a lab). Penn State also offers a year-long Grants Academy program for early-stage investigators, run by senior faculty. This program meets once per month and engages the participants in a mentored process for preparing an NIH grant submission. Investigators learn about grant mechanics and prepare individual sections of a grant that are reviewed and returned each month. Lastly, physician-scientist residents, fellows, and faculty are encouraged to form an interdisciplinary mentoring team facilitated through various programs (e.g., JFDP, FaMe, PSTP), who advise them on their career pathways.

**Metrics of Success:** Metrics for success for physician-scientists include external grant submissions and awards received, publications submitted and accepted, patents and intellectual property, retention in research and clinical trials, and the formation of interdisciplinary collaborations. The effectiveness of the FaMe program, for example, is assessed through deidentified data from a self-assessment survey of FaMe scholars, comparing scholarly activity during the previous year to after the completion of the FaMe program.

## **Wish List for Future Implementation:**

- Penn State has implemented robust institutional machinery to promote the physician-scientist phase of early development (i.e., student to resident to early-career faculty). University leadership would also like to think creatively about how to ensure that midstage investigators are also provided with specific resources (e.g., providing resources for someone who has temporarily lost funding).
- The university promotes and recognizes mentoring (e.g., mentoring awards); however, it currently has no financial incentives to encourage faculty to dedicate their precious time to mentoring. Given the limited pool of mentors for a vast pool of learners, the university would like to think strategically about mechanisms to financially protect mentors and incentivize more faculty to engage, train, and sustain the physician-scientist workforce.

## **Interviewees:**

- **Leslie Parent, MD:** Vice Dean for Research and Graduate Studies at Penn State College of Medicine, Professor in the Department of Medicine and Division of Infectious Diseases, Professor in the Department of Microbiology and Immunology, Co-director of the Medical Scientist Training Program.
- **Chandrika Gowda Behura, MD:** Director of the Physician-Scientist Training Program, Associate Professor in the Department of Pediatrics and Division of Hematology and Oncology.



## University of Alabama at Birmingham Marnix E. Heersink School of Medicine

Home model: centralized (PS plus)

**Institutional Commitment:** The University of Alabama at Birmingham Marnix E. Heersink School of Medicine (UAB Heersink SOM) serves as a hub for academic medicine and research, dedicated to transforming research breakthroughs into improved patient health outcomes. As such, UAB Heersink SOM offers many opportunities for medical learners, faculty, and staff to engage in research. In response to an aging and stagnating national pool of physician-scientist investigators, UAB Heersink SOM institutional leaders established the [Physician Scientist Development Office \(PSDO\)](#). This central office supports and promotes the development and advancement of early physician-scientists across all clinical departments of UAB Heersink SOM and the school of dentistry, including research-oriented undergraduates; predoctoral students in MD, DMD, MD-PhD, and DMD-PhD training programs; postdoctoral scholars in residency and fellowship programs; and early-career faculty. The PSDO offers programs that support individuals from their undergraduate years through their fellowship, ensuring a seamless development path for physician-scientists. Although this initiative involves collaboration across different departments and programs, the PSDO is the core entity that ensures ongoing success for physician-scientists at the institution.

**Fostering a Community for Physician-Scientists:** The PSDO plays a vital role in maintaining continuity at the university by orchestrating meetings, fostering collaborations with leaders throughout the campus, and liaising with various departments and divisions. The PSDO facility is accessible around the clock and equipped with dedicated study rooms, classrooms, conference areas, and social spaces, establishing it as a hub for early physician-scientists. Beyond its physical space, the PSDO connects the UAB Heersink SOM community with the broader Birmingham area through a local chapter of the American Physician Scientists Association, which organizes social events and outreach initiatives.

To further propel the development of physician-scientists, the PSDO capitalizes on a robust partnership with the university's [Center for Clinical and Translational Science \(CCTS\)](#). This collaboration includes shared salary support for PSDO leadership and extends to professional and research trainings for mentees and mentors, career development awards (e.g., the K award) for early-career faculty, and various training programs with broader reach. The PSDO is led by a director and three associate directors, and is staffed by three full-time employees — all of whom are dedicated to advancing the PSDO mission and ensuring comprehensive support for the UAB Heersink SOM community of physician-scientists.

Below are a list of programs and resources for physician-scientist training and development that are provided by and/or highly coordinated through the PSDO:

- In addition to [engagement opportunities for K-12 students](#) (e.g., summer research experiences, science fairs, and internships for precollege students), UAB Heersink SOM has numerous opportunities for undergraduates to engage in clinical and research pathways through the [UAB Heersink SOM Clinical and Research Undergraduate Summer Programs](#).

- All the medical students are required to do a scholarly activity, most of which are research-based. During the summer between the first and second years of medical school, students can participate in [Medical Student Summer Research Programs \(MSSRP\)](#), which include opportunities to conduct mentored, basic biomedical, clinical, translational, educational, community-based, public health, or epidemiological research. Following the second year of medical school, UAB Heersink SOM provides medical students who have

completed their preclinical years with the opportunity to take an enrichment year (either at UAB Heersink SOM or another institution) to engage in elective, mentored research. Moreover, UAB Heersink SOM has many [programs and fellowships](#) designed to provide research experience for medical students interested in research to varying degrees.

- In addition to its robust scholarly activities, UAB Heersink SOM boasts an integrated Medical Scientist Training Program (MSTP), an MD-PhD program that has been continuously supported by the NIH-NIGMS MSTP T32 grant for 35 years. This program exemplifies the UAB Heersink SOM's commitment to developing the next generation of physician-scientists, currently supporting 83 students at various stages of their training. With enhanced support from the UAB Heersink SOM dean, the MSTP aims to increase its student matriculation to 12 students per year with a goal of having 100 students in the program by 2027. This expansion is backed by substantial financial support, ensuring the program can continue to provide a rigorous and enriching environment for aspiring physician-scientists.
- Together, the PSDO and CCTS sponsor the [Predoctoral Clinical/Translational Research Program](#), which exposes students in a health-related program (i.e., MD, PhD, PharmD, DDS, DMD, or DVM) to one year of research training.
- The PSDO also provides [resources, programs, and grants](#) to residents, fellows, and early-career faculty. These various pathways are readily available for those who want to engage in laboratory-based or patient-oriented investigation and discovery.
- To serve Alabama's rural population, UAB Heersink SOM offers the [Deep South Mentored Career Development Program \(K Award\)](#). This program provides opportunities to early-career faculty members with a passion for translational research to help reduce the burden of diseases and improve health conditions that disproportionately affect communities in the Deep South.



## BRIGHT SPOT

*A tension that UAB Heersink SOM must contend with is the desire for more MDs to go into scientific research, balanced by Alabama's dire need for primary care physicians in rural medicine. Given that nearly 44% of Alabama's population lives in rural areas, UAB Heersink SOM has designed unique opportunities that allow physician-scientists at various professional stages to serve rural and underserved communities, such as the Deep South Mentored Career Development Program for early-career faculty.*

**Mentorship and Career Development:** Along with the university's graduate school, the CCTS training academy collaborates with the PSDO to provide interdisciplinary, educational programs for research teams and individuals at all career stages. Monthly presentations, seminars, grant-writing workshops, and mentoring courses are [coordinated with the CCTS](#) to foster the learning and career development of physician-scientists.

**Metrics of Success:** The PSDO engages with an external evaluation team dedicated to systematically monitoring and analyzing the various facets of all associated programs. Through this detailed analysis, the evaluation process measures the immediate outcomes and examines the long-term impacts and sustainability of each program. This holistic assessment approach is crucial for continuously refining and enhancing the office's initiatives, ultimately fostering an environment of excellence in physician-scientist training. The measures in place for the various programs that are evaluated through the PSDO include:

- **Enrollment and retention rates:** Tracking the number of applicants, acceptances, and retention rates in the PSDO programs to evaluate appeal and program stability.
- **Program completion rates:** Measuring the percentage of participants who successfully complete programs, compared to the percentage of those who begin programs.
- **Career progression:** Monitoring the career trajectories of alumni of the PSDO program, such as obtaining faculty positions, leading research projects, or securing leadership roles in academic medicine.
- **Research output:** Quantifying the number and quality of research publications, grants awarded, and patents filed by participants during and after their involvement in the program.
- **Participant satisfaction:** Assessing program satisfaction through surveys and feedback mechanisms to gauge participant engagement and identify areas for improvement.
- **Mentorship quality:** Evaluating the effectiveness of mentorship within the programs, including the frequency and quality of mentor-mentee interactions.
- **Skill development:** Measuring improvements in specific competencies, such as research methodology, scientific writing, and leadership skills.
- **Impact on patient care:** For physician-scientists, evaluating how their research has translated into clinical practice and improved patient outcomes.
- **Collaboration and networking:** Evaluating the extent of PSDO-provided networking and collaborative opportunities, and their impacts on participants' professional growth.

### Wish List for Future Implementation:

- The PSDO hopes to secure additional funding to support “year-out” programs for medical students interested in predoctoral research opportunities. These programs not only facilitate deeper involvement in research, but also serve as stepping stones toward participation in the Physician-Scientist Training Program and American Board of Internal Medicine residencies, thereby creating a more integrated pathway for aspiring physician-scientists.
- Aligning with this initiative, UAB Heersink SOM would like to also establish a mechanism that significantly enhances engagement among residents and fellows. A crucial aspect of this initiative involves identifying and implementing innovative strategies to balance the intense demands of clinical service with the necessity for dedicated research time during these formative stages. Successfully achieving this balance is essential for encouraging more individuals to pursue careers as physician-scientists.

### Interviewees:

- **Randy Seay, MA, MPA, MPH:** Associate Director for Physician Scientist Development Office at University of Alabama at Birmingham Marnix E. Heersink School of Medicine.
- **William M. Geisler, MD, MPH:** Assistant Dean for Physician Scientist Development and Director of the Physician Scientist Development Office at University of Alabama at Birmingham Marnix E. Heersink School of Medicine.

## University of California, San Francisco, School of Medicine

### Home model: centralized (PS only)

**Institutional Commitment:** The University of California, San Francisco, School of Medicine's (UCSF) physician-scientist landscape unifies distinct, but complementary, institutional programs that work in concert to provide guidance along diverse career stages and research interests. In 2021, UCSF established the [Physician-Scientist Career Development Program \(PSCDP\)](#) to support laboratory-based physician-scientists in the residency, fellowship, and early-career faculty stages. As a collaboration between the departments of medicine, pediatrics, and neurology, the PSCDP creates a centralized set of resources, including for career development and networking, and mentoring events for the laboratory-based physician-scientist training community. The PSCDP was founded in collaboration between the vice chairs from its three respective departments. Departments across the campus are eligible to opt in, and the program anticipates growing over time to become a school-wide program. The program works in very close synergy with another crucial hub for UCSF physician-scientist training: the [UCSF Clinical and Translational Science Institute \(CTSI\)](#). The institute promotes the clinical and translational research training of physician-scientists through seven distinct programs, from the undergraduate level to the early-career faculty level. Along with the PSCDP, the CTSI training programs can be viewed as a community hub for clinical and translational scientists on campus. Though UCSF does not have a physical office that connects these two endeavors, their highly effective “divide, conquer, and collaborate” model ensures that developing physician-scientists across the basic-to-translational spectrum obtain exemplary support during the vulnerable period between clinical training and running one's own lab.

**Creating a Home for Physician-Scientists:** Approximately 80% of wet lab-based physician-scientists at UCSF conduct research within the departments of medicine, pediatrics, and neurology; the PSCDP, therefore, fills a critical gap in the lab-based side of the physician-scientist training pathway. Composed of leaders from all three divisions, the PSCDP enhances cross-pollination and the cohesion of perspectives across the campus. The program provides [grant writing, mentorship, and professional development workshops](#).

In addition to the PSCDP, UCSF has a rich array of resources for physician-scientist training:

- In the summer, the CTSI offers the [Pre-Health Undergraduate Program](#) for up to 40 undergraduate students interested in exploring careers in clinical research, who are historically underrepresented in medicine and are planning to attend dental, medical, nursing, pharmacy, physical therapy, occupational therapy, rehabilitation therapy, pharmacology, or other professional schools after graduation.



- UCSF's [Post-baccalaureate Research Opportunity to Promote Equity in Learning \(PROPEL\)](#) provides postbaccalaureate students from disadvantaged backgrounds with the opportunity to engage in research, career and professional development training sessions, networking opportunities, and laboratory mentorships.
- UCSF School of Medicine reorganized its medical training, implementing a [Deep Explore](#) program that requires medical students to complete faculty-mentored, substantive, scholarly exploration of topics related to human health. Medical students are also eligible to take an enrichment year to conduct research.



## BRIGHT SPOT

*UCSF has a research-intensive culture dedicated to physician-scientist training. The institution does not have undergraduates, but instead has a clear focus on biomedical researchers, including MD and MD-PhD students. A standout among its peers, UCSF is extremely open to and supportive of the physician-scientist lifestyle, embracing it as a “validated, normal path.” The institution relieves the pressures from physician-scientists by allowing faculty across clinical departments to spend approximately 80% of their time engaged in lab-based research. Those conducting clinical, translational, and/or population research tend to engage in more collaborative research and spend approximately 20% to 50% of their time dedicated to research.*

- The [UCSF Medical Scientist Training Program](#), which trains MD-PhD candidates, is in its forty-sixth year of continuous NIH support and is highly interwoven into the UCSF physician-scientist community.
- The CTSI [Yearlong Inquiry Program](#), funded by a TL1 grant from the National Center for Advancing Translational Sciences/NIH, is a predoctoral training program open to students in the UCSF School of Medicine and the schools of nursing, pharmacy, and dentistry. This program provides training and mentorship to predoctoral students in clinical and translational research methodology and practice. Students who wish to participate must take a year off from their studies and commit one year (July-June) to clinical and translational research work under the guidance of a UCSF mentor. The program serves up to 11 fellows.
- The Resident Research Training Program provides support for research training to residents across the CTSI community. The program includes a foundational research methods course, guidance on research protocol development for a mentored research project, assistance with scientific writing, and opportunities for research funding and travel grants. The program also provides a foundational workshop in statistical methods, including statistical software. The program serves up to 60 residents each year.
- The CTSI Clinical Research Informatics Postdoctoral Fellowship (CRISP) provides tailored training for clinician investigators who seek to improve health care through the science of clinical research informatics. CRISP fellows receive in-depth training in clinical research informatics and data science through coursework in the [Training in Clinical Research program](#) (department of epidemiology and biostatistics), conduct a mentored



research project, and participate in regular work-in-progress sessions. CRISP awards three fellowships for two years.

- The [Fellows Advancement Skills Training in Clinical Research program](#) provides clinical research fellows at UCSF with ongoing research feedback, structured career development activities, and a tight-knit community.
- The CTSI K-Grant Writing Workshop helps clinical researchers (i.e., early-career faculty or fellows) on key sections of the NIH career development grant (i.e., K08 or K23). This small group workshop is facilitated by two faculty members and is offered three times per year, in time with each NIH grant submission cycle.
- Established in 2013 by the UCSF School of Medicine (in partnership with clinical departments), the annual [Physician Scientist Scholar Program \(PSSP\)](#) provides financial resources, career guidance, and protected research time to facilitate the early transition to independence of one or two highly talented, laboratory-based physician-scientists every year. Applicants to the program can be residents, clinical fellows, or pre-independent laboratory fellows with high potential to conduct transformative, laboratory-based research to advance human health. [PSSP scholars](#) are physician-scientists with exceptional scientific training or potential and have completed Accreditation Council for Graduate Medical Education residency training in a clinical specialty area. The dean's office provides each PSSP scholar with a maximum of \$1.25 million of research funding over five years.
- The CTSI [K Scholars Program](#) supports early-career faculty in building their careers in clinical and translational research. Annual enrollment in this popular program now consistently exceeds 70 scholars, with nine scholars supported by the CTSI KL2 award. The program provides an academically invigorating, supportive environment that encompasses many of the top early-career faculty at UCSF and affiliated institutions. Support includes mentorship and guidance from outstanding program faculty, all of whom are successful clinical and translational researchers with expertise in epidemiology, biostatistics, implementation sciences, scientific writing, and career mentoring.

**Mentorship and Career Development:** Physician-scientist mentoring and career development are highly integrated throughout various on-campus programs. For example, the PSCDP organizes [physician-scientist mentoring committees](#) that provide ongoing career guidance for laboratory-based physician-scientists in medicine, neurology, and pediatrics during the periods of postdoctoral lab training and early independence (pre-R01). Of note, the UCSF program, [Advancing the Research Careers of Historically Excluded Scholars](#), addresses barriers to the career development of historically excluded research faculty. The CTSI has a plethora of career and professional development workshops, including workshops on grant writing, networking, and skills development.

**Metrics of success:** UCSF uses metrics for each program that gauge career success and fulfillment among current and former physician-scientists in training, including how supported they feel or felt at UCSF. Other key outcomes include the numbers of publications and grants awarded, the percentage of time devoted to research, and the length of time a physician-scientist actively

engages in research. UCSF leadership regularly checks in with physician-scientists across multiple stages to assess current and future programming needs and priorities.

## Wish List for Future Implementation:

- Bridge funding for physician-scientists during the postdoctoral phase, who have not yet secured their first K or R grants: At this stage, financial support is particularly important to help keep talented physician-scientists on their career paths.
- Mechanisms to help physician-scientists meet their personal caregiving needs: Many physician-scientists are starting families or assuming caregiving responsibilities during the postdoctoral and early-independent stages, which create challenges from the time-management and productivity standpoints and from a financial perspective. This is especially true in areas with high costs of living, like San Francisco. The challenges of fully engaging in family life and academic life, while maintaining productivity and paying for child care or elder care often drive talented physician-scientists to abandon academic research careers. Support in this area would help promote both job satisfaction and career retention.
- Funding to cover “K” and “above the NIH cap” gaps: Many physician-scientists and their mentors and departments can struggle to support: (1) competitive salaries, particularly for early-career faculty; (2) the gap between total salary and the NIH-funded K award; and (3), among established faculty, the difference between total salary and the NIH cap, particularly in less remunerative clinical specialties. Funds derived from endowments or other sources of philanthropic support would be feasible mechanisms to allow UCSF to retain physician-scientists or cover the NIH salary cap differential, which is approximately 10%-20% annually. The establishment of more departmental or divisional endowed chairs could also be used to ensure stable support for salary funding for physician-scientists.

## Interviewees:

- **Alka Kanaya, MD:** Director of Clinical & Translational Science Training at the UCSF Clinical & Translational Science Institute, Professor of Medicine at UCSF School of Medicine.
- **Alexandra Nelson, MD, PhD:** Associate Professor of Neurology at the UCSF Weill Institute for Neurosciences.

## University of Colorado School of Medicine

Home model: centralized (PS only)

**Institutional Commitment:** The physician-scientist training and career development landscape at the University of Colorado School of Medicine at the Anschutz Medical Campus (CU Anschutz Medical Campus) is comprehensive and collaborative. In 2021, the institution conceptualized and launched the [Program to Advance Physician Scientists and Translational Research \(PAPSTR\)](#) to foster training, career development, diversity, career satisfaction, and retention of physician-scientists on campus. The PAPSTR has an exceptionally comprehensive reach in terms of the career stages that it serves, with initiatives geared at individuals from the postbaccalaureate stage to established senior professors. This program is notable for its integrated collaboration across institutional departments, institutes, and centers; its strategic support for physician-scientists across the training and career spectrum; inclusion of PhD scientists; rich, peer-to-peer interaction; ample protected time for researchers; and mentorship (refer to “Mentorship and Career Development” below).

**Creating a Home for Physician-Scientists:** CU Anschutz Medical Campus utilizes a centralized model with a physical office that primarily serves the physician-scientist community. Collaboration and buy-in of a broad range of community partners underpins the success of PAPSTR; for example, by engaging collaboratively with department chairs, the PAPSTR fosters the research skill development of physician-scientists in different departments, which in turn, allows department chairs to focus on the complementary clinical mission. CU Anschutz Medical Campus leadership refers to this vested interest in achieving shared institutional priorities as the “bloodline” for the program.

The PAPSTR engages approximately 75 individuals along the training and career development pathway through the following programs:

- The [Baccalaureate to Medicine and Research Program \(B2MR\)](#) is a two-year, mentored, research and training program designed to help postbaccalaureate students who are underrepresented in medicine prepare for admission into MD or MD-PhD, biomedical sciences programs.
- [Summer student programs](#) for both college and medical student undergraduates are available.
- Medical students can participate in a one- or two-year research experience, coordinated through the PAPSTR in the [Emerging Physician-Scientist Program](#). Notably, CU Anschutz Medical Campus also offers a vibrant [Medical Scientist Training Program \(MSTP\)](#) that is coordinated through the office of research education. The PAPSTR works closely with the MSTP by including MSTP students in the career development sessions offered to other learners and early-career faculty.

- Residents interested in engaging in research can take advantage of CU Anschutz Medical Campus' [Stimulating Access to Research in Residency \(StARR\) Program](#). The departments of medicine, pediatrics, and surgery participate in StARR, providing dedicated, in-depth research time during residency. Funded by a highly competitive [NIH R38](#) grant, this program enables the medical school to recruit, train, and retain outstanding physician-scientists who are focused on basic, clinical and/or translational research in heart, lung, and blood disorders. Mentorship, coaching, and career development are provided for residents in this program. Eighty percent of a resident's time is funded by the NIH and dedicated to research for up to two years; the remaining 20% of the resident's time is funded by the residency program and dedicated to clinical activities. In addition, the PAPSTR is actively involved in the physician-scientist training program in the departments of medicine and pediatrics, providing support for recruitment, retention, and career development.
- Early-career, MD and PhD faculty interested in pursuing research are eligible for the [Translational Research Scholars Program](#), which funds between five and seven individuals each year for a four-year period to engage in translational research and career development. This program is coordinated across all clinical and basic science departments at CU Anschutz Medical Campus, each contributing funds or intellectual capital (e.g., advising and mentoring) toward the program's mission. This program protects time for research and provides support for new lines of investigation. In addition, the group of 20-25 scholars meets monthly to discuss research and career development.
- The [CU Anschutz SOM Programmatic Incubator for Research \(CU ASPIRE\) Program](#) is designed to help successful, R01-funded faculty facilitate collaborative research groups to solve problems that can only be addressed by team science. The CU ASPIRE Program guides faculty in the development of interdisciplinary, programmatic research, leading to an increase in the medical school's submissions and success of program projects, center grants, and large, multiproject, team science programs. In addition to the CU Anschutz Medical Campus, the CU ASPIRE program is supported by the vice chancellor for research and the University of Colorado Cancer Center.



## BRIGHT SPOT

*"I decided that the success of physician-scientists was dependent on their integration with PhD scientists. It wasn't about creating a new silo of physician-scientists, but rather, immersing physicians in the research environment of the scientists across campus. We wanted to do this in a way that could enable their career development and the rigor and impact of their research."*

— David Schwartz, MD

**Mentorship and Career Development:** The PAPSTR features a [co-mentor training program](#) that provides evidence-based training programs for faculty mentors *and* their MD or MD-PhD mentees. Every individual in the fellowship training stage has a scholarly oversight committee that monitors milestones and career progression. Lastly, informal, monthly career development discussions

attract an intergenerational community to discuss topics ranging from establishing a career vision to career transitions and managing competing priorities.

**Metrics of Success:** The PAPSTR currently uses both objective (e.g., presentations, papers, conferences, grant support) and subjective (e.g., experiences of success) evaluation tools. In addition, PAPSTR has begun to integrate an evaluation tool into their program. Long-term metrics of success are the expansion of programmatic research, a growing pool of successful physician-scientists, departmental participation, and philanthropic support for the PAPSTR.

## **Wish List for Future Implementation:**

- Establish a vice dean for physician-scientist training and career development to expand the program and increase its visibility, and further integrate the career development of physician-scientists and programmatic research with other priorities of the medical school and campus.
- Aim to increase recruitment of interdisciplinary physician-scientists who can conduct interdepartmental programmatic research.
- Have a greater focus on fellows, who represent a critical stage of career development. Currently, fellows are primarily associated with their specific divisions. A program focused on physician-scientist fellows that spans all divisions and disciplines could foster learning, mentorship, and career development, and help create community.
- Offer mechanisms that allow PhDs to gain exposure to the clinical enterprise and, for MDs, exposure to the basic research community, to encourage greater integration of MDs and PhDs.
- Have greater visibility of physician-scientists in all aspects of the academic mission.
- Develop and implement a specialized evaluation for the program initiatives.

## **Interviewees:**

- **David Schwartz, MD:** Distinguished Professor of Medicine-Pulmonary Sciences & Critical Care, Director of the Program to Advance Physician Scientists and Translational Research at the University of Colorado School of Medicine at the Anschutz Medical Campus, Former Chair of the Department of Medicine, and former Director of the National Institute of Environmental Health Sciences.
- **Steve Abman, MD:** Professor of Pediatrics-Pulmonary Medicine, Co-director of the Pediatric Pulmonary Hypertension Program, Director of the Pediatric Heart Lung Center at the University of Colorado School of Medicine at the Anschutz Medical Campus.



## University of Miami Leonard M. Miller School of Medicine

### Home model: distributed

**Institutional Commitment:** The University of Miami Leonard M. Miller School of Medicine (Miller School of Medicine) has several emerging efforts to build a cohesive, institution-wide physician-scientist landscape. The Miller School of Medicine is Florida's oldest medical school, and the University of Miami Health System is notable for pushing the boundaries of clinical care, research, and education. In 2019, the Sylvester Comprehensive Cancer Center earned the coveted National Cancer Institute cancer center designation, the only one in south Florida and one of 71 NCI-designated cancer centers nationwide. As the institution continues to push boundaries, nascent efforts to build a cohesive physician-scientist training landscape have crystallized into view. Robust and ongoing institutional efforts include identifying physician-scientist representation on campus, building and sustaining an institutional culture that values and encourages the physician-scientist track, and mapping out mechanisms to bring together distinct physician-scientist programs into a cohesive community. This profile presents a candid and beneficial roadmap of early-stage mechanisms that can guide the establishment of a more integrated physician-scientist landscape at a research-intensive institution.

**Creating a Home for Physician-Scientists:** The Miller School of Medicine features a distributed model of physician-scientist training and development. Currently, services and resources for physician-scientists are spread throughout various programs and centers within the institution, including the Sylvester Cancer Center; the Clinical and Translational Science Institute (CSTI); and the Medical Scientist Training Program (MSTP), the Miller School of Medicine's MD-PhD program that receives some funding support from the NIH. (refer to bulleted list below). Unique challenges to this model include identifying physician-scientists on campus, establishing a "nucleating point" that brings physician-scientists together, establishing funds for protected research time, and creating a sense of "home" for physician-scientists with formal career development tracks (e.g., for early-career physician-scientists). Though infrastructure is still very much in the construction phase, institutional measures (e.g., time, space, resources) to counteract present challenges include the following:

- Institutional leaders have used shared community events (e.g., the MSTP annual research symposium) to establish a medical school-based interest group for physician-scientist training and development. The establishment of a local APSA chapter is currently a mechanism that serves as a key nucleating point; however, its primary focus remains on medical students, residents, and fellows. As such, the engagement of MD-PhD faculty remains somewhat limited.
- Individuals that recruit physician-scientists should clearly communicate to recruits that they will be provided the resources needed to be transformative, bold leaders who drive research progress. The Miller School of Medicine has mostly utilized philanthropy as a mechanism to provide physician-scientists with funds to ensure protected research time



and start-up packages. A growing number of extramurally funded training grants also contributes to efforts to develop and retain physician-scientists.

Through the Miller School of Medicine and other partners, opportunities to engage in research along the physician-scientist training and career development spectrum include:

- The [Summer Undergraduate Research Fellowship Program](#), run through the Miller School of Medicine and sponsored by the National Cancer Institute, provides undergraduate students with supportive mentoring and programmatic resources to nurture their interest in research-based graduate programs and careers.
- Revamping the traditional medical school curriculum to the revolutionary [NextGenMD](#) curriculum requires all medical students to graduate from the Miller School of Medicine with a scholarly concentration (typically research) under the guidance of a faculty mentor.
- Through the Miller School of Medicine's office of medical education, medical students of all levels are able to engage in a myriad of [short-term and long-term](#) research opportunities, including the opportunity for first-year medical students to compete for an NIH T35 grant that funds a summer research experience.
- The [MSTP](#) provides integrated research and clinical experience toward a dual degree — one pathway to train the next generation of physician-scientists.
- The [Dean's Research Excellence Award in Medicine](#) research scholarship program is a year-long program designed for medical students who are interested in pursuing physician-scientist careers in academic medicine.
- The NIH-funded [Helping to Accelerate Research Potential \(HARP\) UE5 program](#) provides opportunities and mentorship for National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) grantees (i.e., postdoctoral scholars and early-career faculty) who are underrepresented in medicine to establish and maintain successful, independent, academic careers as physician-scientists. While limited to faculty with interest in NIDDK-oriented research, the HARP grant program will allow institutional leaders to offer dedicated coaching, networking, and mentoring to participating faculty members. The expected outcome of this program is to increase the critical mass of scientists and physician-scientists, who could ultimately serve as mentors for those in training.
- Residency programs and fellowship programs from selected specialties and subspecialties have opened a physician-scientist training program, resulting in a higher number of physician-scientists successfully competing for career development awards.
- Through the Clinical and Translational Science Institute, as well as the University of Miami Sylvester Comprehensive Cancer Center, the Miller School of Medicine offers two NIH-supported, K12, Mentored Research Career Development Program Awards in clinical and translational science and cancer-related research, respectively. These programs provide early-stage investigators with full, university faculty-appointment protected time for a mentored, research-career development experience. The goal of these programs is to

develop full research independence and leadership positions in clinical and translational science. In addition, the institute provides an NIH-supported, mentor-mentee training program for early-stage investigators. Additional mentoring and career development opportunities are available at the University of Miami through other large, NIH-funded programs, such as the [Miami Center for AIDS Research](#) and the [Center for HIV and Research in Mental Health](#).

## Metrics of Success:

- More formalized figures of the number of physicians engaged in research on campus; an increase in the number of physician-scientists on campus.
- An increase in the number of NIH-supported T32 grants tailored to the formal establishment of PSTP programs in various specialties.
- Retention of physician-scientists within the university.
- The prevalence of career development grants, similar to K grants.
- A greater number of NIH-awarded, cooperative agreement (U) grants, program project grants or center (P) grants, and training (T) grants, which could all be used to drive research progress beyond the single investigator award on campus.
- Increasing community accessibility through continued community outreach and engagement that includes ensuring that clinical trials and facilities are reachable for all.



## BRIGHT SPOT

*Faculty member and interviewee, Rivka Stone, MD, PhD, was recruited to the Miller School of Medicine in 2019 as a physician-scientist. During her recruitment and onboarding, Dr. Stone was told that — distinct from other clinicians — “her focus was different from other physicians.” This clear messaging highlights the institution’s understanding of the unique demands of the physician-scientist pathway, as well as its commitment to provide resources (e.g., ample protected research time, mentoring) to excel in this profession.*

## Wish List for Future Implementation:

- Institutional resources to ensure physician-scientists have protected time to do research. Like many institutions, protected time is not standardized across all departments/clinical divisions at Miller School of Medicine.
- Formal pathways for physician-scientist development and training.
- Continued investment in a mentorship culture.
- Creation of a formal onboarding process for physician-scientist faculty, including career development and mentorship resources.

- A more robust data collection to capture crucial metrics on physician-scientist representation on campus, allowing leadership to better facilitate connections between physician-scientists.
- Centralizing the administrative management of T32 training grants into an office to provide access for everyone. Currently, the management of T32 is not centralized, a disadvantage for departments that do not have administrative support. While T32 targets a broad range of individuals in training who are not solely physician-scientists, the centralization of this effort would better support physician-scientists.

### Interviewees:

- **Rivka Stone, MD, PhD:** Assistant Professor of Dermatology and Cutaneous Surgery, Co-director of the Dermatology PSTP at the University of Miami Miller School of Medicine.
- **Eric Mellon, MD, PhD:** Associate Professor of Radiation Oncology and Biomedical Engineering, Co-leader of the Sylvester Neuro-Oncology Site Disease Group, Medical Director of Stereotactic Radiotherapy in the Department of Radiation Oncology at University of Miami Miller School of Medicine.
- **Alessia Fornoni, MD, PhD:** Director and Chair of the Peggy and Harold Katz Family Drug Discovery Center, Co-director of the MSTP, Co-director of the CTSI/KL2 and Mentoring Program, Chair of the Faculty Development and Mentoring Committee at the University of Miami Miller School of Medicine.

## Perelman School of Medicine at the University of Pennsylvania

Home model: distributed

**Institutional Leadership:** The leadership at the Perelman School of Medicine (PSOM) at the University of Pennsylvania has a deep commitment to exposing physicians to research at all stages throughout their career paths. The institution has several well-integrated mechanisms that protect research discovery at all levels, and across basic, translational, clinical, and population science. Notably, Penn's clinical and translational research portfolio is extremely well-resourced, with 45% of research funding within the institution supporting clinical and translational research.

**Creating a Home for Physician-Scientists:** PSOM uses the following resources to both spark and foster the research careers of its physician-scientists:

- PSOM offers summer research programs for undergraduate students. One such program is the [Penn Access Summer Scholars Program](#), which provides two consecutive summers of mentored research experiences for diverse cohorts of students, with opportunities to continue research engagement throughout the academic year. In addition to providing a way to join the MD program, the program also offers a path for joining the MD-PhD program.
- PSOM offers a research training program, [Post-Baccalaureate Research Education Program \(PennPREP\)](#), that offers preparation for applying to both the MD-PhD program and the biomedical PhD program. PennPREP has become an important pipeline for admissions to the MD-PhD program.
- PSOM places an emphasis on exposing all medical students to research throughout the four-year curriculum and all students are required to complete a scholarly project in their fourth year of research. Additionally, medical students have numerous, funded options for engaging in [scholarly research projects](#) conducted under the supervision of faculty mentors throughout their time as medical students. Most PSOM students avail themselves



### BRIGHT SPOT

*Penn is home to the largest NIH-funded medical scientist training program (MSTP) in the United States, with 240 MD-PhD students and 23 VMD-PhD students enrolled in the 2025 academic year. Each year, approximately 20% of the entering medical school class are in the MD-PhD program. Notably, MD-only medical students can apply to transfer into the MD-PhD program during their first or second year. Graduates of the MSTP complete residencies in top physician-scientist-friendly clinical programs across the country, with a sizable fraction either remaining at Penn or joining Harvard-affiliated programs in Boston. Long-term follow-up data on Penn MSTP alumni show that 80% or more are working in academia, the NIH, other federal agencies (e.g., the Food and Drug Administration), or in the biotech and pharmaceutical industries.*

of the PSOM Plus program, which provides students with the option to pursue dual degrees, research experiences, and certificate programs.

- Founded in 1958, Penn's NIH-supported MD-PhD program is affiliated with graduate programs in biomedical research, engineering, chemistry, physics, economics, history, and anthropology. It is one of the nation's oldest medical scientist training programs (MSTPs) and is currently the largest in the United States (refer to the Bright Spot).
- Across PSOM, residency and fellowship programs have built-in research time that ranges from three months to two years, which serves to reduce the clinical demand during residency and fellowship. For optimization, physician-scientist-friendly residency program directors at Penn meet to share best practices. In addition, several hold informational sessions each year for students in PSOM's MD-PhD program.
- The faculty structure at Penn allows physician-scientist research faculty with clinical responsibilities in academic tracks to have up to 80% protected time for funded research. To support the vulnerable career transition stage, early-stage investigators at PSOM receive start-up funds to support the establishment of their research programs. New cohorts of tenure and clinician-educator tracks participate in a two-year program designed to ensure that they are supported during the early stages of their first faculty appointments.

**Metrics of Success:** The institution tracks all traditional metrics of research activity, including grant funding, publications, patents and licenses, contributions to FDA approvals, changes in policies and practice guidelines, and time to promotion, among others.

For the MSTP, PSOM tracks the following metrics of success, which were developed by Lawrence F. Brass and Myles H. Akabas for the [AAMC National MD-PhD Outcomes Study in 2015](#):

- Active employment in medical and research training fields (e.g., academia, industry, the NIH, non-NIH research institutes, and biotech and pharmaceutical industries).
- The percentage of professional effort devoted to research.
- Postgraduate clinical training in disciplines that support the physician-scientist model.
- Research funding from the NIH and other sources.
- Publication record during training (and beyond).
- Awards and accomplishments linked to a successful physician-scientist career.

## **Mentorship and Career Development:**

- During faculty recruitment, departments assemble mentoring committees tailored for their assistant professors that provide advice on career development, grant writing, mentoring, and navigating academic tracks.

- Faculty mentorship training is increasingly becoming part of the Penn culture, with mentorship training now required for all faculty who mentor individuals appointed to training grants or who are in formal training programs. Training includes an eight-week program using the [Center for the Improvement of Mentored Experiences in Research](#) curriculum; a two-hour, Penn-developed workshop series; and seminars at the request of department chairs.
- MD-PhD, PhD, and research master's students receive mentorship training upon entering and during their respective programs.
- New faculty receive mentorship training as part of institutional onboarding.

## Wish List for Future Implementation:

- Mechanisms to provide even better support for women physician-scientists.
- A coordinating office for physician-scientist training (such as the one that has been established at Duke University).
- More robust implementation of faculty mentorship training.
- Tracking (i.e., career metrics) of MD-only alumni, who become physician-scientists inside or outside academia.

## Interviewees:

- **Emma Meagher, MD:** Professor of Medicine and Pharmacology, Senior Vice Dean for Clinical and Translational Research, Senior Associate Vice Provost for Human Research, Director of Translational Research Education, Principal Investigator with Clinical and Translational Science Award KL2 and TL1 grants at the Perelman School of Medicine at the University of Pennsylvania.
- **Lawrence “Skip” Brass, MD, PhD:** Professor of Medicine and Pharmacology in the Hematology-Oncology Division, Associate Dean for Combined Degree and Physician Scholar Programs, Director of the Penn Medical Scientist Training Program, Director of the Hematology Research Training Program at the Perelman School of Medicine at the University of Pennsylvania.



## Vanderbilt University School of Medicine

Home model: distributed

**Institutional Commitment:** Institutional leadership has played a consistent and robust role in creating the current physician-scientist landscape at Vanderbilt University School of Medicine (VUSM). Around 1999, the institution invested resources in creating a centralized office for physician-scientist career development for early-career faculty (refer to “Creating a Home for Physician-Scientists”), and around 2017, it created the role of vice president for research integration to ensure that physician-scientists on campus obtain vertical integration and cross-school collaboration as scientists. Notably, previous deans of VUSM have been physician-scientists (the current dean is an alumnus of the MD-PhD program), which has created a great sense of understanding and appreciation for the unique role of physicians in biomedical research.

VUSM leadership expressed a strong institutional commitment to increasing the population of physician-scientists and raising future academic leaders. As a result, mentoring and training of physician-scientists is a prominent part of VUSM’s physician-scientist culture; for example, despite the difficulties of integrating clinical training and research skills into the surgery specialty, VUSM has the highest number of surgeon-scientists on K awards in the nation, due to the financial support provided during training, as well as cross-departmental mentors investing in their success. Notably, even while medical school class sizes have been reduced, the size of the [medical scientist training program \(MSTP\)](#), an NIH-supported MD-PhD program, has increased, effectively amplifying the proportion of medical students engaged in research training. Because VUSM utilizes a data-based approach to inform its strategies on mentoring, training, and programming, it often shares its models and resources with other institutions (e.g., tools for integrating research into the physician-scientist curriculum).

**Creating a Home for Physician-Scientists:** VUSM coordinates the development of physician-scientists through the [Edge for Scholars \(EFS\) office](#), an on-campus, physical, centralized resource for all those along the physician-scientist pathway, including predoctoral students, residents, fellows, postdoctoral researchers, and faculty members at all career stages (approximately 500 individuals total). Though the office does not explicitly offer programming for medical students, it operates with an “all are welcome” mentality and offers seminars and resources to the entire campus. The office has five full-time employees and three faculty members, who help coordinate grants, programming, and databases. Complementary programs are run through VUSM, the MSTP, and department-specific physician-scientist training programs (PSTPs) that streamline postgraduate clinical and research training for individuals committed to pursuing research-based careers in academic medicine.

To build a community of physician-scientists, the associate dean for clinical and translational scientist development meets with each new tenure-track, physician-scientist faculty member, introducing them to the community, resources, and events. With its centralized resources and extensive collaborations across campus, EFS office can also protect researchers in fairly small divisions that lack substantial research activity, thereby mitigating inherent variabilities across clinical divisions.

Below are the programs and resources for physician-scientist training and development:

- VUSM requires all medical students to participate in an independent, mentored, three-to-six-month research project (typically, clinical research).
- Distinct from the EFS office and coordinated through VUSM, the MSTP has a rich history of training MD-PhD students to become physician-scientists. The MSTP defined and uses physician-scientist competencies to guide program development.
- In addition to programs offered by the EFS office, VUSM's PSTPs offer concrete programmatic offerings that serve to reduce attrition of students on the physician-scientist pathway. This is particularly important during the transition between training completion and obtaining a faculty position. VUSM provides early access to resources, such as K grant-writing workshops and seminars on negotiation.
- The EFS office provides tools to promote career development and trajectory (e.g., access to a grant library, [Flight Tracker software](#)), demystify the nature of academic life (e.g., workshops on writing grant proposals and authoring manuscripts), and promote and refine mentoring for both scholars and their mentors.

**Mentorship and Career Development:** The EFS office stays tightly coordinated with the [office of biomedical research education and training](#), which provides support and resources for VUSM biomedical graduate students, postdoctoral researchers, and faculty who train other graduate and postdoc students (including training for mentors by the [Center for the Improvement of Mentored Experiences in Research](#)). To further foster this commitment to a mentorship culture, tenure-track faculty members are required to have an interdisciplinary mentor panel, to further expose physician-scientist researchers to the full scope of extramurally funded, biologically based research. Importantly, VUSM promotes extensive vertical integration: MSTP participants mentor undergraduate students, PSTP participants mentor MSTP participants as associate college advisors, and early-career faculty mentor both MSTP and PSTP participants as college advisors.

**Metrics of Success:** To gauge its performance, VUSM utilizes objective measures of success, such as extramural funding, publication records, and invited presentations. Its data-driven, evidence-based style is largely enabled through its database software, Flight Tracker. Developed at Vanderbilt and used by over 50 institutions, Flight Tracker automates the tracking and analysis of career development of biomedical scholars (e.g., those on training [T] and early-career [K] grants). Flight Tracker offers metrics on career outcomes (e.g., publications, funding, training activities), visuals (e.g., an



## BRIGHT SPOT

*"We've kept it really practical. Business schools talk about providing services, and my office conceptualizes everything we do as a service to researchers, to clear the path for them, so they can do more and better science more quickly. Because I'm a quantitative scientist, I think about everything like data. I like our information to behave like data, and we like to analyze it like data."*

— Katherine Hartmann, MD, PhD

up-to-the-moment K-to-R conversion calculator), and other tools (e.g., social network graphs). VUSM also recognizes mentoring and collaboration as metrics of success; for example, social networking groups, as displayed by Flight Tracker, demonstrate an increase in research collaboration across disciplines.

**Wish List for Future Implementation:** Institutional leaders would like to amplify resources that are available to specifically help residents and fellows transitioning to faculty positions. They would also like to better establish a paradigm where individuals can exit the research workforce for personal reasons (e.g., parental leave) and return to it, which would likely reduce loss of physician-scientists at the most vulnerable points.

### Interviewees:

- **Katherine Hartmann, MD, PhD:** (Previously:) Vice President for Research Integration, Associate Dean for Clinical and Translational Scientist Development, Professor of Obstetrics and Gynecology and Medicine, Lucius E. Burch Chair of Reproductive Physiology and Family Planning at Vanderbilt University Medical Center.
- **Patrick Hu, MD, PhD:** Associate Professor and Director of the Physician-Scientist Training Program in the Department of Medicine at Vanderbilt University Medical Center, Assistant Dean for Physician-Researcher Training, and Director of the Office of Medical Student Research at Vanderbilt University School of Medicine.

## Washington University School of Medicine in St. Louis

### Home model: centralized (PS only)

**Institutional Commitment:** Washington University School of Medicine in St. Louis (WUSTL School of Medicine) has a rich history of physician-scientist training. Spearheaded in the late 1960s, physician-scientist training at WUSTL School of Medicine had historically been focused on its NIH-funded, dual-degree (MD-PhD), medical scientist training program (MSTP; also supported by institutional resources and an endowment). In 1969, the institution's biomedical PhD training model transformed from departmentally siloed programs to an interdisciplinary, multi departmental, umbrella structure: the division of biology and biomedical sciences (DBBS). One of the first of its kind in the country, the DBBS was developed in part to meet the needs of MD-PhD students whose research interests may not have been well-aligned with traditional scientific disciplines at the time. Over time, the DBBS has served as a road map for the physician-scientist training landscape at WUSTL School of Medicine. In 1998, the department of medicine established the physician-scientist training program (PSTP; refer to the Bright Spot), which has since spread to other clinical departments at the university and across the country. In 2019, WUSTL School of Medicine was awarded a Burroughs Wellcome Fund grant designed to promote a stronger focus on physician-scientist training for physicians without advanced research degrees. Established in 2019 with funds from the Burroughs Wellcome Fund and institutional resources, the new division of physician-scientists (DPS) is modeled after the interdisciplinary, interdepartmental DBBS graduate program. Serving residents, fellows, and early-career faculty, its primary goal is to bring together developing physician-scientists from different clinical departments for postgraduate physician-scientist training and career development.

The mission of the division is to strengthen the national pipeline of physician-scientists (especially those without PhDs) by providing strong, institutional support for their training. This additional focus broadens the reach of WUSTL School of Medicine's legacy and service to the physician-scientist workforce. In addition to the DPS, the school's landscape of physician-scientist training is built on collaborations between many synergistic players on campus that include [the Office of Medical Student Research](#) (supports MD-only student research); the MSTP, which has been one of the largest in the nation for many years; PSTPs; and other physician-scientist training programs.

**Creating a Home for Physician-Scientists:** WUSTL School of Medicine found that postgraduate physician-scientist residents and fellows, particularly those who are not in formal research training programs, often lack the cohort, structure, and knowledge to pursue physician-scientist careers, especially if they are interested in basic science investigation. The DPS was designed to mitigate the barriers uniquely faced by physician-scientists: By providing additional career development

seminars and programs, as well as building a larger community of physician-scientists in training than are available in any single department, the division complements programs available through PSTPs (which are themselves generally focused on MD-PhD students in individual departments). The DPS was also successful in obtaining an NIH R38 Stimulating Access to Research in Residency (StARR) grant to provide research career development for resident investigators in different departments. The DPS also coordinates with WUSTL School of Medicine's [Institute of Clinical and Translational Sciences](#), which offers clinical research training (funded by an NIH Clinical and Translational Science Award); thus, the DPS plays a crucial role in bringing together campus partners that share the mission of fostering physician-scientist development in the basic sciences.

The DPS offers the following programs that target career stages, from early clinical training to faculty appointment:

- WUSTL School of Medicine has two NIH R38 StARR awards — for [oncology](#) and [infectious diseases/immunology](#) — that provide clinical residents in several departments with one to two years of dedicated research time during residency training. The infectious diseases/immunology R38 award is administered by the DPS.
- The [Dean's Scholars program](#) is an award for mentored research that supports outstanding physicians who do not have advanced research degrees and are committed to becoming physician-scientists. The program provides individuals who have completed clinical training with mentorship, institutional support, and protected research time for generating data and publications, thereby preparing them to compete for NIH awards for research-career development (e.g., K08 grants). Dean scholars, who receive support for two years (including educational loan repayment), can devote at least 75% or 50% of their time to basic science research for nonsurgical and procedural specialties, respectively. Departments value this program by providing salary support, aiming to at least match the DPS' own support, and protecting research time.
- The [Interesting Patient Study \(TIPS\) program](#) builds on the observation that many successful physician-scientist faculty embarked on their investigative careers because they were inspired by patients they saw in clinical training. The TIPS program provides clinical residents and fellows — in any WUSTL School of Medicine department — the opportunity to study more deeply patients whom they see in the clinic or hospital, whose underlying pathologies would benefit from investigative research done by local experts at



## BRIGHT SPOT

*The nation's first [physician-scientist training program \(PSTP\)](#), which guides medical school graduates from their clinical and postdoctoral research training years to their full-time academic appointments, was established in WUSTL School of Medicine's Department of Medicine. Though the school now has robust PSTP programs across a growing number of departments, DPS leadership noted that improved coordination between the individual programs could create a critical mass of individuals in training, with more opportunities to share best practices and enhance career development; this effort could also help include individuals in training from departments that have no formal programs. Additionally, since most PSTP participants have both MDs and PhDs, the PSTP is not a training path typically available to those who lack PhDs. Leveraging its legacy, WUSTL School of Medicine has continued to innovate by identifying and implementing mechanisms that widen the scope of physician-scientist training; the division of physician-scientists is a testament to this innovation.*



core facilities. Supported by the Burroughs Wellcome Fund institutional training grant for physician-scientist development, the TIPS program does not require residents and fellows to take dedicated time away from their clinical work, since data are collected by core facilities; the program requires low time commitment and is intended to be compatible with clinical residents' and fellows' busy schedules. The DPS helps these individuals find basic laboratory mentors to help them craft research plans, which are presented at a TIPS conference for feedback. If approved, funds are provided for research studies and bioinformatics expertise to help the residents and fellows analyze their data for presentation at a future TIPS conference. Through these methods, the TIPS program aims to fuel residents' and fellows' interest in investigation.

**Mentorship and Career Development:** As referenced above, WUSTL School of Medicine offers a variety of interactive, monthly seminars for career development. For example, [the Community of Academic Physician-Scientists in Training \(CAPSiT\)](#) supports the career development of physician-scientists through seminars, workshops, and networking and mentorship activities. CAPSiT events are open to all and are relevant to many career stages, from medical students to junior faculty. In addition, CAPSiT offers small-group mentoring during which (mostly) fellows and others in groups of six to 10 individuals are connected, based on their career stages and research interests. Each group meets monthly, each time with a different senior-faculty, physician-scientist mentor, to discuss pertinent topics that are designed to help build community and connect individuals. The DPS also cosponsors with the PSTPs an annual symposium and poster session for physician-scientists in training.

**Metrics of Success:** WUSTL School of Medicine's many programs that support physician-scientists (e.g., the MSTP, PSTPs, DPS, R38 programs) all conduct ongoing assessments to measure their own successes and areas for growth. Commonly tracked metrics include publications, grants awarded (both mentored and independent), career advancement and milestones reached during and after exiting the training program, and whether former program graduates are still engaged in research. Many programs use additional survey tools to quantify other aspects of training; for example, the DPS uses the Clinical Research Appraisal Inventory (CRAI-19) scoring system to monitor measures of perceived self-efficacy across many research-related activities for the dean scholars.

**Wish List for Future Implementation:** As the division continues to expand, division leaders would like to implement creative ways to have more one-on-one time with physician-scientists in training, in order to provide personalized solutions, guide them to mentors, and help them feel supported overall. Plans are being developed to enhance integration of the DPS with the Institute of Clinical and Translational Sciences and other programs.

## Interviewees:

- **Wayne M. Yokoyama, MD:** Sam and Audrey Loew Levin Professor of Medicine, Professor of Pathology and Immunology, Director of the Medical Scientist Training





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Program, Associate Dean of the Division of Physician-Scientists at Washington University School of Medicine in St. Louis.

- **Jacqueline Hawkins-Salsbury, PhD:** Director of Scientific Training of Physician-Scientists in the Division of Physician-Scientists at Washington University School of Medicine in St. Louis.

## Appendix A. The Physician-Scientist Training and Career Development Home Advisory Committee

### CO-CHAIRS

**Robert Alpern, MD**

Ensign Professor of Medicine (Nephrology)  
Professor of Cellular and Molecular  
Physiology *Yale School of Medicine*

**Valerie Williams, PhD, MPA**

University of Oklahoma Presidential  
Professor, OU Health Sciences Center  
Graduate College  
Vice Provost of Academic Affairs and Faculty  
Development  
*The University of Oklahoma Health Sciences Center*

### COMMITTEE MEMBERS

**Paul Hauptman, MD**

Dean  
*University of Nevada, Reno, School of  
Medicine*

**Keith Norris, MD, PhD**

Professor of Medicine, UCLA Division of General  
Internal Medicine and Health Services Research  
*University of California, Los Angeles, David Geffen  
School of Medicine*

**Mira Irons, MD**

Former Senior Vice President for  
Academic Affairs  
*American Board of Medical Specialties*

**Vincent Pellegrini, MD**

Professor and Chair of the Department of  
Orthopaedics and Physical Medicine  
*Medical University of South Carolina College of  
Medicine*

**Karen Kaul, MD, PhD**

Chair of the Department of Pathology and  
Laboratory Medicine  
*NorthShore University Health System*

**Mercedes Perez-Rodriguez, MD, PhD**

Associate Professor of Psychiatry  
Associate Training Director for Research  
Associate Director of Medical Student Education  
*Icahn School of Medicine at Mount Sinai*

**Christopher Kontos, MD**

Professor of Medicine in Cardiology  
Professor of Pharmacology and Cancer Biology  
Director of the Medical Scientist Training  
Program  
*Duke University School of Medicine*

**Doris Rubio, PhD**

Assistant Vice Chancellor for Clinical Research  
Education and Training, Health Sciences  
Professor of Medicine, Biomedical Informatics,  
Biostatistics, Nursing, and Clinical and Translational  
Science  
Director of the Institute for Clinical Research  
Education  
*University of Pittsburgh School of Medicine*



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### **Robin Lorenz, MD, PhD**

Executive Director of Research Management and  
Research Pathology  
*Genentech, Inc.*

### **Kay Lund, PhD**

Former Director of the Division of Biomedical  
Research Workforce Programs  
*National Institutes of Health*

### **Alice Weaver, MD**

Fellow in Hematology/Oncology  
*University of Colorado School of Medicine at the  
Anschutz Medical Campus*

### **Christopher Williams, MD, PhD**

Associate Dean of Physician-Scientist Education and  
Training  
Professor of Medicine  
Director of the Medical Scientist Training Program  
*Vanderbilt University School of Medicine*

## Appendix B. The Committee Charge

*Editor's note: This document has been edited for clarity.*

Physician-scientists play an essential role in medicine by tying the bench and the bedside closely together. There have been numerous calls to action, including from the National Institutes of Health and the AAMC, which express concern that the physician-scientist workforce is forecast to decline in size as older investigators retire. Several institutions have begun to create “homes” for physician-scientists, which provide support for new physician-scientists across career stages and departments. Such homes may be formal institutional programs, networks, or other communities that support the training and development of individuals pursuing physician-scientist careers. Homes can help shift some of the responsibility of providing support to these individuals from departments to the institution itself, understanding that supporting physician-scientists effectively ultimately requires collaboration among the departments, medical school, and parent institution.

### **The advisory committee will:**

1. Define and consider the consequences of establishing a physician-scientist training and career development home.
2. Identify key educational principles that all physician-scientists should obtain through training and career development.
3. Identify the key institutional components for creating a home for physician-scientists in training and early-career faculty. Examples include, but are not limited to:
  - a. Defining scope/goals of a home.
  - b. Targeting levels of individuals' training and the degrees to which physicians are supported.
  - c. Evaluating measures of success of individuals and programs.
  - d. Generating institutional buy-in and resources.
  - e. Gaining faculty support for recruitment and training of physician-scientists.
  - f. Ensuring a diverse, equitable, and inclusive environment.
  - g. Providing career and professional development.
  - h. Strategizing for protected time.
  - i. Fostering mentorship.
4. Present several home models that will help support physician-scientists in training and early-career faculty. The committee will identify institutions that have implemented the components identified above and can, therefore, serve as living models for institutional leadership to learn from.



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This committee will represent a diverse range of expertise on the various stages of training and career development. The project will result in an AAMC publication that institutions can use as a resource for examples and potential new strategies on how to further assist their physician-scientists in training and early-career faculty.

## Appendix C. Institutional Survey

### Physician Scientist Survey 2022-2023 [English (United States)]

In this survey, we seek information about the programs, activities, and initiatives in place at your institution to support physician-scientists. You have been selected to participate in the survey because of your role in overseeing, directing and/or administering initiatives and programs for physician-scientists at your institution. The information that you provide will be used to assemble case studies that will inform our community about the approaches several institutions have taken regarding supporting physician-scientists.

Participating in this activity is voluntary. The questionnaire should take no longer than 15 minutes to complete. The data collected in this survey are classified as Unrestricted. Unrestricted data are data that may be published with individual or institutional identification. We intend to present findings in a written profiles report, as an AAMC analysis, and during presentations at academic conferences. Participants will have the opportunity to review their institutional profile prior to publication. Although individuals will not be identified by name, title or position, results will be published by institution.

After the conclusion of this survey, we may contact you with additional questions and to provide information about the interview portion of this project.

This activity has been reviewed according to the AAMC policies and procedures. If you have any questions about this questionnaire, please contact **Jodi Yellin** ([jyellin@aamc.org](mailto:jyellin@aamc.org)) or **Julia Omotade** ([jomotade@aamc.org](mailto:jomotade@aamc.org)). By continuing, you acknowledge that you read the above and agree to participate.

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1. What programs do you have at your institution (school of medicine, affiliated health system, research center/institute, or allied health programs) for aspiring or early-career physician-scientists? **Select all that apply:**

- ☐ Research programs for pre-college students
- ☐ Research programs for college students
- ☐ Research programs for postbaccalaureate students
- ☐ Research programs for MD students
- ☐ MD-PhD program
- ☐ Certificate programs
- ☐ Masters programs (i.e., MPH, biostatistics, clinical research)
- ☐ Research Residency program in one or more specialties
- ☐ Research residency umbrella program (i.e., a program that oversees research residency programs across multiple specialties)
- ☐ Faculty development program
- ☐ Other (please specify): \_\_\_\_\_

This Question is Conditionally Shown if: (1 (Research Residency program in one or more specialties) = Selected)

2. If applicable, please indicate in what specialties below, as defined by the American Board of Medical Specialties (ABMS), you have a research residency program.

**Please check all that are applicable** and indicate if it is an ABMS member-board research residency program, a physician scientist training program (PSTP), or other program that allots protected time for research and is focused on training researchers.

	ABMS	PSTP	Other
Allergy and Immunology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anesthesiology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Colon and Rectal Surgery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dermatology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency Medicine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Family Medicine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internal Medicine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medical Genetics and Genomics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neurological Surgery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nuclear Medicine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obstetrics and Gynecology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ophthalmology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Orthopedic Surgery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Otolaryngology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pathology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pediatrics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical Medicine and Rehabilitation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plastic Surgery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Preventative Medicine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Psychiatry and Neurology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surgery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thoracic Surgery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(End of Page 2 )

3. Which of the following programs or activities does your institution offer to increase faculty diversity among physician scientists? **Select all that apply:**

- ☐ Institutional programming and/or training for mitigating unconscious bias
- ☐ Institutional funds committed to increasing the diversity of research scientists
- ☐ Recruitment efforts targeting those in the biomedical workforce who are underrepresented in research populations
- ☐ Other (please specify): \_\_\_\_\_

4. What considerations are given for expanding student and resident diversity in recruiting and retaining physician scientists? **Select all that apply:**

- ☐ Mitigating unconscious bias in admissions
- ☐ Recruitment efforts targeting underrepresented in research populations
- ☐ Holistic assessment of applicants and/or recruits
- ☐ Other (please specify): \_\_\_\_\_

5. What components are available at your institution for supporting physician-scientists along the training and career pathway? **Select all that apply:**

- ☐ Centralized source of funding opportunities for physician-scientists
- ☐ Dedicated work and/or social space to encourage physician-scientist networking
- ☐ Career development workshops/courses and skills training for students, residents, and fellows
- ☐ Career development workshops/courses and skills training for faculty
- ☐ Centrally guided mentoring program
- ☐ Mailing list/ listserv/social media site to share news, publicize events relevant to physician-scientists
- ☐ Institutional website dedicated to physician-scientists to share resources, news and events
- ☐ Cross program and/or departmental social events to promote networking across physician-scientists
- ☐ Cross program and/or departmental physician-scientist research symposium
- ☐ Other (please specify): \_\_\_\_\_

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**6a.** In which areas has the COVID-19 pandemic **strengthened** the training and career development of your physician-scientist program? **Please select all that apply and rank in order from most strengthened (1) to least strengthened (7).**

	1	2	3	4	5	6
Recruitment of trainees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recruitment of faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Retention of trainees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Retention of faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Program Support (e.g., program size/resources)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diversity, Equity, Inclusion and Accessibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**6b.** In which areas has the COVID-19 pandemic **disrupted** the training and career development of your physician-scientist program? **Please select all that apply and rank in order from most disrupted (1) to least disrupted (7).**

	1	2	3	4	5	6
Recruitment of trainees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recruitment of faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Retention of trainees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Retention of faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Program Support (e.g., program size/resources)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diversity, Equity,	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

This Question is Conditionally Shown if: (7 = Yes)

**8. What career stage does the office cover? Select all that apply:**

- ☐ College students
- ☐ Medical students
- ☐ Residents
- ☐ Fellows
- ☐ Early-career faculty
- ☐ Mid-career faculty
- ☐ Late-career faculty

This Question is Conditionally Shown if: (7 = Yes)

**9. Indicate the defined metrics and outcomes utilized for review of the office. Select all that apply:**

- ☐ Program participant satisfaction
- ☐ Science identity (number of individuals identifying as members of the physician-scientist community)
- ☐ Research Engagement (i.e., funding, publications)
- ☐ Career outcomes (i.e., positions, awards)
- ☐ Centralized office not evaluated
- ☐ Other (please specify): \_\_\_\_\_

This Question is Conditionally Shown if: (7 = Yes)

**10. Did the office exist in FY2021?**

- ☐ Yes
- ☐ No

This Question is Conditionally Shown if: (10 = Yes AND 7 = Yes)

**11. Indicate the following for FY 2021:**

The office budget in dollars for personnel, facilities, equipment, and programming

\_\_\_\_\_  
Estimated FTE for administering the office (round to nearest tenth place)

This Question is Conditionally Shown if: (10 = Yes AND 7 = Yes)

**12. Indicate the sources of support for the office for FY 2021. Select all that apply:**