

Strategic Plan for the Health Sciences at the Pennsylvania State University

University Health Sciences Council
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Introduction

Despite the remarkable success of biomedical research and health care in prolonging life expectancy and curing acute and chronic infections, there still remain serious and worrying challenges for the future. The cost of health care and income disparities has escalated inequities in both access to quality health care and health outcomes. Health care providers in rural and impoverished areas face particularly challenging circumstances, and it is increasingly difficult for families to provide care at home. These problems are exacerbated with an aging population and a predicted shortage of health care providers in many specialties. Added to this is the presence of drug resistant infections that make hospitals dangerous places for patients and health care providers alike and the continual threat from unknown emerging diseases that can spread rapidly around the world.

Alongside these disheartening trends are exciting new developments that hold the key to significant improvements in our health care system. Scientific breakthroughs in molecular biology provide new insights into the genetic bases of disease and the chemical causes of cancer allowing us to tailor prescriptions to the individual. Within the next few years, we will have complete genomes for individuals that will enable innovative applications of personalized medicine. Additionally, new imaging and analysis technologies allow rapid diagnosis. At the institutional and community level, health care quality improvement researchers and health service engineers are exploring better ways to deliver health care and provide health care coverage, placing greater emphasis on wellness and the prevention of health problems than has been the case historically. The internet provides the means for physicians and research scientists to collaborate around the globe. New educational paradigms have restructured health science education and created stronger linkages with our partners in the Commonwealth and beyond.

This Strategic Plan for the Health Sciences at the Pennsylvania State University, developed by the University Health Sciences Council, provides a vision of how Penn State can address the challenges we currently face to advance the health sciences. The plan was developed in consultation with hundreds of members of the University community, including administration, faculty, and staff, and was approved by the University Health Sciences Council on December 3, 2008. The plan builds on the notable success Penn State has experienced over the past decade and, at the same time, emphasizes directions and priorities that will enhance our competitive position and advance Penn State University's health sciences impact and reputation.

The Strategic Plan for the Health Sciences provides a roadmap for Penn State to solidify its reputation as one of the top health sciences universities in the country by focusing on three major goals:

- (1) build the infrastructure to support translational science and research;
- (2) foster interdisciplinary, multisite work in the health sciences around four areas of research excellence—chronic and neurological disorders, infectious diseases, cancer research and clinical excellence, and health systems improvement;
- (3) create new degree-granting programs at Penn State that address regional, state, and national health workforce, science, and technology needs.

The focus of this strategic plan is to identify areas of strength and promising convergences among Penn State faculty who are dispersed across campuses, colleges, and programs. The plan proposes innovative ways to move those areas forward and, in so doing, improve health sciences across the

University as well as the quality of care for Penn State staff and faculty. In particular the plan emphasizes opportunities to strengthen relationships at all levels between faculty in the College of Medicine and Penn State Hershey Medical Center and faculty in other Colleges at University Park and other campuses and units engaged in health sciences research, teaching and service. While a strong vision, enhanced collaboration and communication among participating campuses, colleges, and institutes are essential for advancing Penn State's mission in the health sciences, new resources and funding will need to be identified to ensure successful implementation of this plan.

Vision and Mission for the Health Sciences at Penn State

Definition of Health Sciences

Health Sciences are the disciplines of applied science that deal with human health. There are two parts to health sciences: the study, research and knowledge of health, and the application of that knowledge to improve health, to prevent and cure disease, and to understand how humans function. Research builds on the life sciences, the social sciences, and, in the case of bioethics, the humanities.

Vision: To create world class health sciences research, education, and practice at Penn State for the purpose of transforming health care through the integration of life, physical, engineering, information, medical and social sciences.

Mission: The Health Sciences Council will improve the health of humans by improving the quality, access and cost of healthcare for the Penn State community, the Commonwealth, and beyond.

The Health Sciences Council will work to create a culture that:

- Provides the larger academic community, as well as future employers, with graduates who are highly competent, independent, and ethical researchers, teachers and clinicians.
- Fosters interdisciplinary collaboration by working with the institutes and the colleges to identify and support areas of excellence.
- Supports faculty, staff and students in their interdisciplinary efforts with state-of-the-art resources, facilities, and training.
- Advances knowledge related to the health sciences.
- Supports community engagement and reaches across the Commonwealth and worldwide to diverse peoples.

Goal 1: Build the infrastructure to support translational science and research.

Objective A: Obtain the Clinical and Translational Science Award (CTSA) from the National Institutes of Health.

In 2005 the National Center for Research Resources (NCRR) issued a call for applications for Clinical and Translational Research Awards that would transform how institutions translated research findings into tangible health benefits that improve lives. In the request for application (RFA), the National Institutes for Health (NIH) called for a *transformation* of institutions and the science of investigators to help speed up the impact of new discoveries on health. In response to this challenge, Penn State is establishing the Clinical and Translational Sciences Institute (CTSI). The Penn State CTSI will serve as an independent institute outside all the colleges that will be a highly integrated academic engine for clinical and translational science, akin to the functions of other institutes at Penn State. Although the CTSI will span the campuses and colleges of Penn State, it will have a particularly close relationship with the Huck Institutes for the Life Sciences and the Social Science Research Institute. The CTSI will build on the strong tradition and rich experience of collaborative interdisciplinary thinking that exists at Penn State and bring this wide breadth of academic endeavor to bear on the health of people – starting with traditional biomedical activities but including social sciences, arts, communications, economics, education, engineering, ethics, and health care delivery and policy.

The long-range goal of the CTSI is to develop, implement and make available to the community at large new methods to predict, prevent and effectively treat human disease. A top priority for the CTSI is to ensure that the most pressing problems for people and society receive priority and that solutions find their way expeditiously back to people and society. This will necessitate engaging with the community to establish trust, identify needs, and establish a venue for implementation and evaluation of new predictive, preventive and treatment strategies. Another mandate of the CTSI is to train the next generation of health professionals and investigators to work competently across multiple and emerging disciplines, sensitive to the overarching purpose of health research, and equipped to successfully deal with ethical and socioeconomic issues that arise when technological capabilities and the society's imperatives meet with economic constraints.

The Penn State CTSI will provide the means for Penn State investigators and partner institutions to pursue broad goals that go beyond those typically advanced in conventional investigator-initiated research. The needs of the community (patients, individuals at risk, and populations) and knowledge gaps identified through community engagement and participation of all stakeholders will drive the research. There is an urgent need to expand the current biomedical research and healthcare focus from that of a curative model to one where disease prediction (e.g., genomics, biomarkers, behavioral and environmental markers, etc.) will enable prevention and personalized care. The efficient delivery and dissemination of more effective healthcare practices is the ultimate goal of the CTSI. Guided by recognized needs and knowledge gaps and empowered by cutting-edge methodologies from throughout and outside the University, the CTSI will assist and enhance these efforts by providing and developing shared resources and enabling investigators to leverage each other's capabilities.

Objective B: Create a College of Medicine Regional Campus at University Park.

The location of the Penn State Milton S. Hershey Medical Center 100 miles from the University Park campus in State College, the presence of a single community medical center in the State College area, and the fact that Penn State University is the only employer of scale in the region presents a unique opportunity for a regional medical campus. This strategy would meet multiple needs including:

- 1.) increasing the quantity and level of medical care in the area to ensure that the health care needs of the university's workforce are met.
- 2.) providing specialized educational opportunities (e.g., dual-degree programs that combine medicine and other disciplines) that attract students to Penn State and enhance the research activities and educational environments across a wide variety of units at Penn State
- 3.) allowing the University to provide health care and wellness opportunities for its workforce and their dependents.
- 4.) integrating the critical/complex care systems of the Penn State Milton S. Hershey Medical Center with the Mount Nittany Medical Center.
- 5.) ultimately, increasing research collaboration between the University Park campus and the Hershey campus.

The changing medical climate in the State College area will require action in a relatively short period of time in order for these goals to be accomplished. Fortunately the degree of alignment between the University, Mount Nittany Medical Center, health care providers in the area, and Penn State Milton S. Hershey Medical Center (PSHMC) is greater than in the past, increasing the likelihood of realizing these benefits. Leaders will work together to support the establishment of a regional medical campus in State College, Pennsylvania.

Establishing a regional medical campus in State College will benefit the University by

- Improving medical education by implementing a successful curriculum and program of instruction by receiving input and participation of faculty from across the health and biomedical community.
- Establishing opportunities for attracting students interested in pursuing multiple degrees (i.e., MD/PhD, MD/MBA, MD/MEd, MD/MHA, MD/JD).
- Lowering the cost of health care for the University community.
- Improving the attractiveness of the State College area to health professionals, thereby relieving workforce shortages in the Centre Region and improving quality of care.
- Increasing the level of medical care at Mount Nittany Medical Center and the surrounding clinical community.
- Increasing intercampus cooperation and collaboration between Hershey and University Park.

The success of a regional medical campus in State College will require the support and active involvement of many colleges at Penn State University, the Mount Nittany Medical Center, and health care providers in the community in order to be successful. A regional medical campus would bring significant benefit to the academic community, health care providers and all of those living in the State College area. We propose the regional campus with the understanding that the costs involved will be modest, and the funding will be derived from a combination of medical school tuition, new state funding, fees from clinical services in the State College area, and philanthropy.

Objective C: Create World Class Biomedical Sciences Research Across the University.

The Council wishes to build upon research strengths and create an environment that supports world-class biomedical research across colleges, disciplines and geography. This can only be achieved by working with the Social Sciences (SSRI), Life Sciences (Huck), Penn State Hershey Medical Center and other groups.

Resources for collaboration across the University System should focus on:

- a) Connecting faculty to one another.
 - Provide opportunities for faculty and students to meet and interact around important topics of mutual interests
 - Provide collaborators with needed “networking” software and hardware to have meetings at a distance from their offices.
- b) Creating incentives for expanded exchange of knowledge and faculty.
 - Create a seed grant system focused on a postdoctoral fellowship program that would integrate campuses and colleges each relevant to an issue and funded for up to 2 years as an investment in the production of new and large grants.
 - Create a competitive seed grant program for collaborative teams that must include both College of Medicine and University Park faculty. This could include funds for linking and networking (Level 1) and funds for seeds grants (Level 2), as is done by the Social Science Research Institute (SSRI).
 - Provide a “scholarship” for which clinicians can apply to get release time to collaborate on research. Encourage faculty to engage in the Intercollege Graduate Degree Programs (IGDPs).
 - Create opportunities for sabbaticals and faculty exchanges.
- c) Support the development of innovative educational programming.
 - Provide support for integrative graduate degree minors and majors focused on topic.
 - Provide resources for faculty to use technology for cross-campus educational collaborations and outreach education to Pennsylvania health care providers.
- d) Identify opportunities for the construction and renovation of facilities that provide a centralized location in which to co-locate scientists from multiple colleges, integrating clinical and basic research in one site.

Goal 2: Foster interdisciplinary, multisite work in the health sciences around areas of research excellence.

Objective A: Promote research, education and outreach/patient care in Chronic and Acute Neurologic Disorders through better linkages among disciplines and between campuses.

The Penn State Institute of Neurosciences (PSIN) will be expanded to serve as the focal point for the development of neurosciences at Penn State. The institute will be designed to bring together Penn State’s outstanding neuroscience researchers and clinicians so that they have opportunities to mutually influence one another and push the field forward. The institute will bring together the significant strengths of the neurosciences at Penn State in a multidisciplinary setting under the leadership of a

Director with the goal of addressing the teaching, research, and practice missions of the university. The PSIN will harness expertise to address such important health areas as amyotrophic lateral sclerosis (ALS), movement disorders, aging and cognition, multiple system atrophy (MSA), epilepsy, restless leg syndrome (RLS), neuro-oncology, traumatic head injury, and stroke and rehabilitation. PSIN will accomplish its goals by building and linking a suite of Centers of Excellence involving faculty from multiple programs at Hershey, University Park and other campuses in the following areas:

- Molecular and Cellular Neuroscience
- Center for Neuroengineering
- Center of Neurotoxicology
- Emerging Neurotechnology and Imaging at Hershey
- Center for Memory and Aging
- Stroke research
- Traumatic Brain Injury
- Movement Neuroscience Laboratory
- Motor Control Group
- Augmentative and Alternative Communication Group
- Social and Life Sciences Imaging Center (SLIC)

The PSIN also expects to take a leadership role in providing seminars and courses to improve interaction between the Hershey and University Park campuses, helping to establish a strong cross-campus IGDP neuroscience graduate program and creating opportunities for research and training for undergraduate students, honors students, medical students, graduate students, combined degree students, nursing students, post-doctoral fellows in a variety of disciplines and residents. The Institute also will seek training grants and support the pursuit of National Institutes for Health (NIH) K-awards and other faculty development opportunities.

The PSIN will work to integrate activities across the Clinical and Translational Sciences Institute, the Magnetic Resonance Research Center, the new 3T research MR facilities at Hershey and University Park, and the new Penn State Hershey Neuroscience Institute and Penn State Hershey Rehabilitation Hospital.

Objective B: Promote research, education and outreach/patient care in Infectious Disease through better linkages among disciplines and between campuses.

The infectious disease initiative will strengthen Penn State's already outstanding research on the transmission and evolution of infections and connect areas of excellence at the Hershey and University Park campuses. These goals will be achieved under the umbrella of the newly formed Penn State Institute of Infectious Disease, which will build new centers of excellence linking current areas of expertise in disease dynamics and immunology to new areas of focus including sexually transmitted diseases, vector borne infections, vaccine application, and pathogen evolution. The Institute will build these areas of excellence and foster innovative opportunities such as linking areas of excellence in infectious disease with research areas such as climate change, neuroengineering, chemical ecology, cyber science.

The central thrust of this initiative will be a new thematic program in Pathogen Evolution and Transmission (PET) that will address pressing issues related to the emergence of new pathogens and seek conceptual links between organismal adaptations to novel selective pressures (e.g., new pathogens, immuno-suppressive infections, drugs, vaccines), and in so doing, discover novel ways to avoid the evolution of resistance. The key question to be addressed within this initiative is how

anthropogenic drivers shape the evolution and emergence of new pathogens, and in turn, the disease burdens of the future. The institute will appoint new cross college faculty who will focus on the growing evolutionary issues associated with vaccine escape and drug resistance. Cluster hires will include clinical epidemiologists, empirical scientists and mathematical modelers. Studies will examine the mechanisms by which pathogens have evolved to become more virulent or more resistant to drugs, and will seek to identify techniques to control infections and avoid the development of resistance. To provide a foundation of data for these efforts, the PET program proposes to initiate a cohort study of people in central Pennsylvania and to track incidence of infectious and non-infectious diseases, exposure to infections and environmental factors, and genetic status.

The study of infectious disease is a growing area in which Penn State could make significant contributions to addressing local, national and global health problems, such as emerging diseases and drug resistant infections in hospitals. Coupled with the increasing threat of infectious diseases and the need to develop new ways of avoiding disease emergence, a goal of the institute is to train the researchers and policy makers of the future. Toward this end, the option of a Professional Masters and Doctoral program will be explored that integrates human and animal health with theory. The initiative will embrace life sciences, social sciences, systems engineers, and health workers, and will involve the majority of University colleges.

Objective C: Promote research, education and outreach/patient care in Cancer Research and Clinical Excellence through better linkages among disciplines and between campuses.

Penn State has identified a need for academic health centers to increase the knowledge base related to cancer and to aggressively prevent, treat and cure the many forms of this disease in diverse populations. To this end we seek recognition for the Penn State Hershey Cancer Institute (PSHCI) as a National Cancer Institute (NCI) to promote cancer research, education and outreach as well as clinical excellence, through better linkages among disciplines and between campuses. Achieving NCI designation will showcase the PSHCI as having achieved the high level of scientific excellence and the capability to integrate the multiplicity of research approaches necessary to advance the ultimate goal of eliminating suffering and death due to cancer by 2015.

Significant progress towards NCI designation has been made as validated by peer review of the External Advisory Board for PSHCI. To ensure the success of this effort over the next two years, PSHCI leaders must attract the best trainees and new scientists and clinicians, while encouraging the establishment of new technology as an economic engine for Central Pennsylvania. Outcomes of this recruitment effort will include the development of Phase I/II clinical trials unit and continued growth in the NCI funding base. Achieving the required benchmarks, \$16 million dollars in research and 15% intra- and inter-programmatic publications, will position PSHCI to submit a competitive NCI Cancer Center Support Grant (CCSG) in May 2010.

Upon the 2009 opening of the new 180,000 sq ft cancer institute building, the PSHCI will combine centralized, comprehensive, and coordinated clinical care and basic science research under one roof. This state-of-the-art facility will foster translational research and allow for the recruitment and retention of outstanding cancer researchers in central Pennsylvania. It will enable state funds to be leveraged for federal and private funds to enhance innovative research discoveries and effective treatments, while simultaneously increasing interactions between basic and clinical scientists. However, the greatest impact of the new building will be on the lives of cancer patients in Central Pennsylvania and their families: both will benefit from increased efficiency in translating advanced

medical research into increased survival and improved quality of life. The benefits will be better care for cancer patients and, through interactive community education programs, enhanced knowledge of all aspects of cancer, including prevention and control.

Intra- and inter-programmatic collaborations designed to enhance cross campus, inter-departmental and interdisciplinary collaborations that result in advances in cancer prevention, diagnosis and treatment are important benchmarks that must be fostered by the PSHCI in order to achieve NCI-designation. The Institute's scientific research programs will continue to drive interdisciplinary collaborations through their mutual support of faculty participation spanning the campuses. To further enhance the PSHCI capability to address cancer disparities among rural populations, the Cancer Control and Population Science Program will coordinate outreach, intervention and outcome studies spanning the 28 counties in Pennsylvania that comprise the PSHCI catchment area. Working closely with Penn State faculty across the University and with community members, organizations and agencies, these established partnerships will allow for the expansion of outreach, intervention, and outcome analyses across rural Pennsylvania.

Objective D: Promote research, education and outreach/patient care in Health Systems Improvement through better linkages among disciplines and between campuses.

1. Integrated Health Care Delivery Systems

Integrated Health Care Delivery Systems (IHCD) is an interdisciplinary endeavor that recognizes that the key barriers to health systems improvement are usually problems of quality and access. Quality care means not only offering the best that medical science can provide but also more humanized interactions between the provider and the patient. Access means reducing the disparities in care that arise in different regions as well as for diverse groups of varying socio-economic status.

This initiative will develop a Center for Healthcare Engineering and Information Technology to conduct research in the field, laboratory and in-silico that will lead to a quantum leap improvement in health care delivery and outcomes. This Center would seek to design and engineer a new holistic system of care to cover the spectrum of patient needs from prevention to survivorship. By creating this Center we hope to obtain initial funding of projects with a transition to sponsored research dollars from federal or private sources.

The Center will identify opportunities to improve access to care and quality of care delivery and will share these findings with the Penn State Hershey Medical Center and its regional healthcare partners. It will examine the application of engineering and business management principles to varied components of healthcare delivery microsystems (e.g., Emergency Department, Operating Rooms, Laboratories, Radiology, Clinic, Admission, Discharge, etc.). The Center will facilitate introduction of methodologies in healthcare that improve access, increase quality, and eliminate waste. To successfully offer this service, a rollout and adoption plan will be designed to promote liaisons between academic and clinical programs to use existing demonstration projects, share case examples between PSHMC and regional clinical partners, and leverage existing relationships. Through the initiative in Integrated Health Care Delivery Systems, Penn State could offer a Masters in Healthcare Service Engineering (HCSE), undergraduate courses in HCSE, post-graduate medical fellowships in healthcare engineering/IT/systems management, and undergraduate courses to be taken in preparation for other advanced degree granting programs. This initiative in Integrated Health Care Delivery Systems meets the need to apply engineering and business principles to delivery systems in healthcare, with Information Sciences and Technology facilitating a more human interaction. The use of

healthcare information technology configured for the use of providers could free time for more and higher quality interaction with patients. Creation of a Penn State Center of Healthcare Engineering and Information Technology could provide a virtual and physical location for like-minded providers and provide the basis for a new discipline that fills a need within healthcare. This center would serve as a teaching and learning environment for Penn State faculty and students. The center ties many strengths of Penn State into one cohesive function that could transform healthcare delivery, thus catapulting Penn State into a position of national leadership in Integrated Healthcare Delivery Systems.

2. Incentives for Value-Based Innovation and Improvement

Problems related to the cost, quality and access to health care continue to be a societal burden, and the resolution of these problems is considered by many to be the most important domestic issue facing the United States today. In order to seriously address these problems, credible and well developed scientific evidence is needed. This scientific evidence is gathered through “action research” conducted through partnerships between the research community and various stakeholders in the health care system to test the role of incentives, policy changes, and supply side innovations. Collectively this research is called Incentives for Value Based Innovation and Improvement (VBII), and Penn State is well positioned to be a national and international leader in this area.

VBII is an interdisciplinary initiative that focuses on using financial and non-financial incentives to address the health systems improvement problems of cost, quality and access, with the ultimate goal of achieving better outcomes and value for health care expenditures. VBII recognizes that the barriers to a better performing health care system are the lack of appropriate incentives, policies and payment structures. VBII is focused on eliminating systems issues that prevent the wide scale adoption of effective health care practice and cost-effective delivery at the population level.

Goal 3: Create programs and projects that educate the interdisciplinary workforce of the future and that address regional, state, and national health workforce, science, and technology needs.

As a result of current and future health professions workforce shortages that will be exacerbated by an aging U.S. population, particularly in certain states including Pennsylvania, the Council examined current educational offerings at peer institutions. In contrast with other CIC or research-intensive universities, Penn State does not offer graduate degree programs in fields such as Physical Therapy, Occupational Therapy, Pharmacy, Veterinary Medicine, Dentistry, Physician Assistant, Public Health, or Optometry. Demographic shifts will create additional burdens on the existing health care system, but they also provide opportunities for advancing PSU resources and infrastructure to educate adult learners motivated to enter careers in the health professions. To better understand the opportunities, barriers, and resources required to establish similar programs at Penn State, the Council proposes a comprehensive assessment and may include recommendations to:

- Adjust existing programs to create additional capacity.
- Add schools or programs in collaboration with faculty and administrators.
- Create a taskforce or coordinating council to ensure that recommendations are considered fully for implementation.

Efforts are already underway at the College of Medicine to develop two new graduate level programs to begin in the 2010-2011 academic year, including a Masters of Physician Assistant Studies and a Masters in Public Health in collaboration with the College of Health and Human Development. Appropriate faculty will be involved in planning these cross-college, interdisciplinary programs.

The Penn State Consortium for Simulation Excellence is a collaborative effort among Penn State campuses that strengthens Penn State's respective simulation programs and objectives, facilitates the outreach of those efforts to the benefit of healthcare providers in the community, accelerates the progress of research on validation of simulation as an evidence-based patient safety technology, and projects Penn State as the Commonwealth's leading innovator in technology driven health care education. The Consortium will develop education and service mission relationships between the departments and programs of schools at University Park and the other Penn State campuses. It will identify, develop, and assess educational content specifically for the benefit of healthcare in underserved communities, ensuring rural access to high-quality "state-of-the-art" health sciences education. This will enhance opportunities for interdisciplinary and cross-campus collaborations in education, and improve the health status of the Commonwealth's population through improved clinical techniques and skills. The Consortium will drive simulation standards and quality, project the face of simulation throughout the Commonwealth, and encourage the recognition of health care simulation as a patient safety imperative.

Conclusion

Penn State University is well-positioned to advance its tripartite mission in the health sciences. While biotechnology offers the continued promise of new cures and treatments and improved health, the Commonwealth, the nation and the world face monumental challenges around cost, quality and access to health care. Within the U.S., given the economic realities of delivering health care to all citizens, the coming years are likely to be a period of unprecedented change in our nation's health care system. This Health Sciences Council Strategic Plan is intended to provide direction to position Penn State as a leader in shaping the new systems of care for the future. Similarly, the plan supports the growth and development of intercampus research initiatives that leverage Penn State's strengths in the engineering, information, life, medical and social sciences coupled with the clinical enterprise of the only academic medical campus in central Pennsylvania. Working together, we can promote health throughout the region, across the nation, and around the world.