

# News from NINR

## Translational research and nursing science

Patricia A. Grady, PhD, RN, FAAN

*“There are not two sciences. There is science, and the application of science, and these two are linked as the fruit is to the tree.”*

—Louis Pasteur

Basic research seeks to increase or advance knowledge through systematic investigation of a subject or phenomenon. In the healthcare sciences, basic research typically involves an exploration into physiologic processes at the level of the molecule, cell, tissue, or organism, and pathophysiologic mechanisms of injury or illness.

Still, science does not thrive in a vacuum. As Louis Pasteur noted generations ago, there is a link between “science, and the application of science.” In a recent interview with *The New York Times*, National Institutes of Health (NIH) Director Dr. Francis S. Collins acknowledged the importance of disciplines such as biochemistry and genetics, but stated, “We are not the National Institutes of Basic Sciences.” He urged scientists to consider the clinical or therapeutic applications in their work, saying, “We have to make the case for what biomedical research has to offer the public.”<sup>1</sup>

The findings from basic studies in healthcare science drive progress toward deeper discoveries about the mechanisms of both health and disease, but their usefulness and impact may not be readily apparent. Improving how we apply these findings in real world settings promises to advance the capacity of science to address the increasingly complex health care challenges in our world today. The application of scientific findings to clinical practice is the function of a rapidly expanding field of science known as “translational research.”

Nurse scientists are adept at studying how individuals respond to illness or adapt to changes, using data and observations derived from clinical settings to the design and development of their basic and applied research. Thus, the perspective of nurse scientists is vital to

identifying the most effective strategies to accelerate translational research.

## THE TRANSLATIONAL RESEARCH CONTINUUM

Translational research transforms scientific findings or discoveries from basic laboratory, clinical, or population studies into new clinical tools, processes, or applications. Thus, improving patient care and promote public health. The intent is to build the bridge from “bench to bedside.”

Early models portrayed translational research as a linear, unidirectional process that moved research findings in discrete steps from the laboratory through Phase I or Phase II trials to Phase III trials, before moving to general clinical practice or to broader populations and community settings.

As the field advances, though, experience reveals that translational research is a more robust and dynamic process involving bidirectional stages and complex feedback loops. The first stage, referred to as “early translation,” takes place after a promising discovery is made in the lab or arises from an epidemiologic or other study, and involves the initial development and testing of an intervention. If the intervention proves beneficial and passes any required regulatory approval, it can move onto “late translation,” where it becomes available for testing in larger clinical trials.

However, this is not the endpoint. The next stage, dissemination, involves the broader distribution of the intervention (eg, new drug, medical device, educational materials) to health care providers or to the public, by way of research reports, clinical guidelines, professional education and training, or by informing changes in policy. The intervention must then be adopted into practice by providers or accepted as a beneficial and desirable change by the target patient population or the general public. In addition, ongoing assessment of the outcomes helps to determine the effectiveness of the intervention or suggest modifications. Without these critical steps, the initial discovery may never gain broad acceptance or have an impact on healthcare practice, policy, and economics at local and national levels.<sup>2</sup>

The stages of translational research work in two directions—to continuously develop and reevaluate an intervention across diverse settings and populations, and to proactively integrate data from real-world settings

Patricia A. Grady, PhD, RN, FAAN, is Director of the National Institute of Nursing Research, Bethesda, MD.

Corresponding author: Mr. Raymond Joseph Bingham, National Institute of Nursing Research, Office of Science Policy and Public Liaison, 31 Center Drive, MSC-2178, Building 31, Room 5B-10, Bethesda, MD 20892-2178.

E-mail: [binghamr@mail.nih.gov](mailto:binghamr@mail.nih.gov)

Nurs Outlook 2010;58:164-166.

0029-6554/\$—see front matter

Published by Elsevier Inc.

doi:10.1016/j.outlook.2010.01.001

into the inception, design, and development of new basic and applied research studies.

## TRANSLATIONAL RESEARCH AND COLLABORATIVE TEAM SCIENCE

Historically, research has been a highly interactive process often involving a team approach. Enhancing team science to improve its ability to work across disciplines and professions may well be the hallmark of 21st century science and is now commonly seen as the key to advancing translational research. Team science may make use of a range of modalities:

- **Multidisciplinary:** Coordination of research among scientists of different backgrounds and disciplines.
- **Interdisciplinary:** Cooperative effort of scientists on issues that fall between disciplinary boundaries.
- **Transdisciplinary:** Collaborative projects where information exchange, the modification of scientific approaches, and the integration of scientists and approaches from different disciplines advances research toward a common scientific goal.

By using the experience and expertise of healthcare scientists, from both basic and clinical backgrounds, and by combining a range of different viewpoints and approaches, team science helps to facilitate the translation of basic science findings into general practice.

## CROSSING THE DIVIDE

Healthcare scientists continually evaluate their goals and objectives in translational research to monitor progress toward achieving targeted health outcomes. In turn, the data from these analyses allow scientists to promote effective interventions, modify less effective ones, and identify new areas of need.

Overall, the health sciences have established robust and productive basic science programs to develop the early stages of translational research. In addition, substantial advances have been made in testing the discoveries from these programs in controlled, clinical study settings—studies that determine the internal validity or efficacy of an intervention in the treatment and/or prevention of diseases and disorders.

A report from the Institute of Medicine, *Crossing the Quality Chasm: A New Health System for the 21st Century*, indicates there has been less success in translating these early stage advances into generalizable, extensible, and effective interventions that can be implemented and maintained across multiple settings.<sup>3</sup> Scientists tend to lose much of the momentum and effective assimilation of evidence-based interventions at the latter stages of the translational continuum. To the point that many health interventions may demonstrate high internal validity in tightly controlled clinical trials, but frequently lack robust external validity and fail to be scalable and sustainable in real-world applications.

Translational research addresses this gap between research and research application. It addresses the internal and external validity—to help scientists identify strategies that promote the ready translation of research findings into timely, effective, and efficient practice innovations across diverse community and population-based settings. The feedback loops inherent in the translational research process allow research to inform practice and practice to inform research, toward the goal of improving health care.

## NURSE SCIENTISTS AND TRANSLATIONAL RESEARCH

NINR supports a wide range of translational research projects that are serving to close the gap between research and practice. To help illustrate the promise of this approach, I would like to present two examples.

### *Genomic Analysis of Painful Peripheral Neuropathy*

Current data indicate that approximately 40 million people worldwide are living with HIV. Highly active antiretroviral therapy (HAART), involving the combined use of multiple anti-HIV drugs such as a protease inhibitor and a nucleoside reverse transcriptase inhibitor (NRTI), has helped extend the lives of many patients with HIV. However, HAART is associated with multiple side effects, including painful peripheral neuropathy (PPN), which can diminish quality of life and even lead to noncompliance with medication therapy.

Dr. Susan Dorsey and colleagues at the University of Maryland School of Nursing, and with the NINR Intramural Research Program, are investigating the molecular basis for PPN. Using a mouse model, they assessed both behavioral and physiologic responses to stavudine, a commonly prescribed NRTI. In one published result, they found that transcription of the gene called *giant axonal neuropathy* (Gan1), as well as the level of gigaxonin, the Gan1 protein, decreased significantly in stavudine-treated mice versus those who received saline.

This finding suggests that Gan1 and gigaxonin play a role in the pathophysiology of PPN. Such research may lead to the development of treatment interventions to decrease PPN in patients with HIV who are receiving HAART.<sup>4</sup>

### *Psychosocial-Behavioral Intervention for Post-stroke Depression*

Post-stroke depression (PSD) is a serious complication that affects as much as one third of stroke survivors. It can impair rehabilitation and recovery, as well as elevate the risk for subsequent strokes, cardiac events, and death. Although the use of antidepressant medications to treat PSD has shown varying degrees of short-term efficacy, few studies have examined nonpharmacologic interventions or long-term outcomes.

Dr. Pamela Mitchell and colleagues at the University of Washington conducted a clinical trial of a brief, nurse-led psychosocial intervention called “Living Well with Stroke (LWWS),” with more than 100 stroke survivors who exhibited symptoms of PTSD. LWWS involved counseling sessions with a specially trained stroke rehabilitation nurse to teach coping and problem-solving skills. In addition, several sessions were devoted to improving mood by helping the participants identify and increase their participation in pleasant social events and physical activities.

Depression scores among LWWS participants were significantly lower after treatment and at a one-year follow-up compared with those in a control group who received standard care. In addition, more participants in the LWWS group achieved remission from their depression compared with the control group, both immediately after treatment and at a one-year follow-up.

The success of LWWS gives hope to stroke survivors, as well as their family caregivers, that behavioral interventions and counseling can reduce the incidence of PTSD, which in turn should help promote recovery.<sup>5</sup>

## THE NIH CTSAS

In 2006, the NIH launched a new initiative to develop a consortium of institutions and research centers involved in translational research, called the Clinical and Translational Science Awards (CTSAs). The consortium now includes 46 member institutions in 26 states. When the program is fully implemented, it is expected to support approximately 60 CTSAs across the nation.

CTSA-funded institutions share a common vision to accelerate the translation of laboratory discoveries into treatments for patients to engage local communities in research and to train a new generation of clinical and translational researchers. Their projects are bringing together scientists from many backgrounds to find new ways to address common health conditions and diseases such as cancer, cardiovascular disease, diabetes, and obesity. For more information, please visit: <http://www.ctsaweb.org>.<sup>6</sup>

## CONCLUSION

The translation of science into practice at the NIH is one of the basic themes proposed by Dr. Collins, who said, “We have to take advantage of the new discoveries of the causes of diseases, to push that agenda forward as rapidly as we can to develop diagnostics and preventive strategies and therapeutics for the diseases we currently treat poorly or often can’t even diagnose.”<sup>7</sup>

Several factors can help us as scientists to promote translational research:

- **Pursue new ways of thinking and working.** Scientists at the NIH, as well as at academic institutions, must critically evaluate and assess current assump-

tions, processes, and organizational structures to ask whether there are better ways to support and facilitate translational research.

- **Pay attention to the interface.** As collaborations grow, increased attention is needed to explore how scientists from different areas interface to best use and share their strengths. Even in team science, individuals are the key catalysts.
- **Educate, educate, educate.** Training and educational efforts involving partnerships with schools and community organizations and outreach to community leaders and legislators can help involve members of the public in fruitful discussions and help them understand the meaning and importance of scientific research.

As Goethe reminds us, “Knowing is not enough, we must apply. Willing is not enough, we must do.” Translational research provides the means to apply the knowledge derived from basic healthcare research to interventions that improve health. With our clinical expertise, nurse scientists are well positioned to take leadership roles and serve as catalysts in the growth of this emerging field of science. At NINR, we will continue to support studies across the broad range of science, while promoting the essential role of translational research in connecting research findings to optimal health outcomes for all.

## REFERENCES

1. Harris G. For NIH Chief, issues of identity and culture. *The New York Times*, October 6, 2009.
2. National Cancer Institute. Translating research into cancer care: delivering on the promise. Available at: <http://deainfo.nci.nih.gov/advisory/pcp/pcp04-05rpt/reporttrans.pdf>. Accessed November 20, 2009.
3. Institute of Medicine. Committee on Quality of Health Care in America. Crossing the quality chasm: a new health system for the 21st Century. Washington (DC): National Academy Press; 2001.
4. Dorsey SG, Leitch CC, Renn CL, Lessans S, Smith BA, Wang XM, et al. Genome-wide screen identifies drug-induced regulation of the gene giant axonal neuropathy (Gan) in a mouse model of antiretroviral-induced painful peripheral neuropathy. *Biol Res Nurs* 2009;11:7-16.
5. Mitchell PH, Veith RC, Becker KJ, Buzaitis A, Cain KC, Fruin M, et al. Brief psychosocial-behavioral intervention with antidepressant reduces poststroke depression significantly more than usual care with antidepressant: living well with stroke: randomized, controlled trial. *Stroke* 2009;40:3073-8.
6. National Center for Research Resources. NCRN fact sheet: clinical and translational science awards. 2009. Available at: [http://www.ncrr.nih.gov/publications/pdf/ctsa\\_factsheet.pdf](http://www.ncrr.nih.gov/publications/pdf/ctsa_factsheet.pdf). Accessed November 23, 2009.
7. Garnett D. Coming home: Collins sworn in as NIH Director. *NIH Record*. Available at: [http://nihrecord.od.nih.gov/pdfs/2009/09042009\\_Record.pdf](http://nihrecord.od.nih.gov/pdfs/2009/09042009_Record.pdf). Accessed December 3, 2009.