What Is Translational Research? Concepts and Applications in Nutrition and Dietetics

Jamie Zoellner, PhD, RD; Linda Van Horn, PhD, RD; Philip M. Gleason, PhD; Carol J. Boushey, PhD, RD, MPH

ABSTRACT

This monograph is tenth in a series of articles focused on research design and analysis, and provides an overview of translational research concepts. Specifically, this article presents models and processes describing translational research, defines key terms, discusses methodological considerations for speeding the translation of nutrition research into practice, illustrates application of translational research concepts for nutrition practitioners and researchers, and provides examples of translational research resources and training opportunities. To promote the efficiency and translation of evidence-based nutrition guidelines into routine clinical-, community-, and policy-based practice, the dissemination and implementation phases of translational research are highlighted and illustrated in this monograph.
J Acad Nutr Diet. 2015;115:1057-1071.

THIS MONOGRAPH IS TENTH IN A SERIES EXPLORING the importance of research design, statistical analysis, and epidemiologic methods as applied in nutrition and dietetics research. The purpose of this series is to help registered dietitian nutritionists (RDNs) and aspiring researchers apply and interpret analytic and scientific principles consistent with high-quality nutrition research in their own work. This monograph focuses on translational research, emphasizing the dissemination and implementation phases. Numerous definitions and models of translational research exist, which can trigger diverse meanings of this concept across disciplines, yet underscores the importance of translational research across nearly all health professionals.[1-3] In brief, translational research is the process of applying laboratory research to human studies and enhancing the adoption of evidence-based practices in real-world settings to reach broad populations. Translational research provides the data underlying evidence-based clinical practice and population-based health promotion efforts, thereby offering direct relevance for RDNs. To effectively communicate within a multidisciplinary health care and/or research team, RDNs should become familiar with prominent translational research models, concepts, methods, resources, and training opportunities.

It takes an estimated 17 years to translate 14% of research discoveries into day-to-day practice.[4] Labeled as the 17-year odyssey, this alarming statistic is attributed to a number of factors along the research pipeline, ranging from the number of years it takes to transfer knowledge from the completed research stage to submission and acceptance for publication, to indexing through bibliographic databases, to inclusion in systematic reviews, to the development of evidence-based guidelines, and to the dissemination and implementation of evidence-based guidelines.[4-6] Other estimates suggest this process takes closer to 24 years.[7] Regardless, this lag time is considered excessive, and a more rapid implementation of conclusive findings to provide public health benefit endorses the principles of translational research. For example, while the 20-year National Cholesterol Education Program produced three Adult Treatment Panel Guidelines as well as Population Based Guidelines and the first ever Pediatric Panel Guidelines for prevention and treatment of cardiovascular disease, none of these reports were derived from the type of systematic reviews that are currently required for the 2010 Dietary Guidelines for Americans and the American Heart Association/American College of Cardiology guidelines published in 2013.[8-12] These systematic reviews now encompass the quality, quantity, and ranking of the research available that form the basis for the recommended guidelines. The growing emphasis on translational research has further supported a better defined and more rapid turnaround than what was previously more often based on expert opinion and therefore lacked efforts and evidence for broad-scale dissemination and implementation.

Efficiency and productivity in converting conclusive research into practice are now high priorities for RDNs, including both practitioners and researchers. This monograph describes prominent models and fundamental processes of translational research, defines key terms and discusses critical methodological considerations for speeding the translation of nutrition research into practice, illustrates how translational research concepts can be applied, and

To take the Continuing Professional Education quiz for this article, log in to www.eatrightPRO.org, go to the My Account section of the My Academy Toolbar, click the "Access Quiz" link, click "Journal Article Quiz" on the next page, and then click the "Additional Journal CPE quizzes" button to view a list of available quizzes.

provides examples of key translational research resources and training opportunities. For purposes of advancing the field of nutrition and dietetics research and because of the paucity of peer-reviewed publications in the dissemination and implementation phases of translation research, this monograph specifically focuses on these dissemination and implementation phases.[13,14] Because RDNs serve key roles within health care, community, and research systems, they have important responsibilities related to the translation of evidenced-based nutrition research into clinical practice and population-based health efforts.

MODELS OF TRANSLATIONAL RESEARCH

To adequately comprehend the related research concepts, methods, and measurement issues presented in this review, familiarity with prominent translational research models is helpful. The goal here is to highlight some commonalities and critiques among several current models, leaving the investigator free to choose the best approach.

Simply stated, translational research represents the transition between basic laboratory research and evidence-based practice, described by Sung and colleagues[15] as Translation 1 and Translation 2. Translation 1 is the translation of basic biomedical science to applied studies, including initial clinical testing in humans; and Translation 2 is defined as the translation of clinical science and knowledge into clinical practice and health decision making. Some have argued, however, that a two-phase model of translational research is too narrowly defined,[3] resulting in the development of several other multiphase (eg, three-[16,17] and four-phase[18]) models. For example, Westfall and colleagues[16] expand on Sung and colleagues' model to include a Translation 3 (Translation 3). The Translation 1 of Sung and colleagues' and Westfall and colleagues' model is similar; both focus on the translation from basic science to human studies. However, Westfall and colleagues' model further divides Sung and colleagues' Translation 2 into two distinct phases. Specifically, Westfall and colleagues' Translation 2 phase depicts research moving from early clinical trials (eg, small clinical trials testing treatments with healthy study participants) into later clinical trials (eg, randomized controlled multicenter trials with large and more diverse patient groups), and successively to guideline development, meta-analysis, and systematic reviews. The Translation 3 phase moves research from controlled clinical trials into more practical and more broadly generalizable practice-based research, as well as dissemination and implementation research. Dissemination and implementation research involves an active research approach of spreading evidence-based interventions to targeted audiences, and includes the process of integrating evidence-based practices and interventions into real-world settings.

Westfall and colleagues clearly denote translational steps that have historically been missing from medical and nutrition research, such as the translation of scientific discoveries from laboratory/research settings to patients receiving care in real-world ambulatory care settings.[16] These steps provide a critical connection from academic scientific discoveries to improving individual patient care and to subsequently advancing public health.

Several other models are also frequently noted in the translational research literature. In the "3 T's roadmap model," Dougherty and colleagues define Translation 1 as activities to test what care works, Translation 2 as activities to test who benefits from promising care, and Translation 3 as activities to test how to deliver high-quality care reliably and in all settings.[17] Alternatively, Khoury and colleagues'[18] model defines translational research as Translation 1 from gene discovery to health application, Translation 2 from health application to evidence-based guideline, Translation 3 from guideline to health practice, and Translation 4 from practice to health impact. Across each of these models, there are distinctions in the number of phases and associated terminology, yet the underlying key features and research progressions are remarkably similar. Nonetheless, Trochim and colleagues[6] critique the literature on translational research models by noting that the conflicting numbers and definitions across the translational research phases have the potential to complicate communication and confuse interpretations. A thorough synthesis of the underlying differences and commonalities among these models can be found elsewhere.[6]

Although each of these models incorporates the concept of bi-directionality, another critique of translational research models is the conventional linear approach. As a result, new conceptual models continue to emerge, including those that highlight the dissemination and implementation phases of translational research, such as the "evidence integration triangle" proposed by Glasgow and colleagues.[19] Within a multilevel context, evidence and stakeholders are central in the "evidence integration triangle"; surrounded by interactions among three main components, including intervention program/policy, implementation processes, and practice progress measures. Regardless of the specific model of translational research, each provides guidance in understanding the process of moving from basic, to clinical, to broad population health research.

METHODOLOGICAL CONSIDERATIONS IN TRANSLATIONAL RESEARCH

Key Concepts and Methods in Translational Research

Figure 1 details key concepts in translational research and thus the confidence that any individual study informs the translational message/guidance for a body of research. First, a key translational research concept is the distinction between a study's internal and external validity.[25] Internal validity can be defined as the degree to which study bias is minimized so that a study produces valid estimates of a causal relationship within the study sample.[20] External validity can be defined as the degree to which findings based on a study sample can be generalized to other populations and settings.[20] Both types of validity are critical, yet study designs often face a tradeoff between internal and external validity such that strengthening the features of one type of validity compromises the other. In designing and executing research studies, the threats to internal and external validity should be dually considered. Historically, emphasis in research has been placed on protecting internal validity.[26] However, to increase the likelihood that evidence-based guidelines and programs fit within local circumstances and real-world settings, more attention to conducting research with high external validity is needed.