

Clinical and translational research: What is it, and why should we care?

Translational research is research that translates discoveries and analyses to practical approaches to improving the health or health care of humans. It is critical to ensuring the relevance of research, critical to maximizing the potential of technology transfer, critical to optimizing the synergy within and between universities and academic health centers, critical to ensuring maximal economic impact and job creation – and most of all, critical to improving the health of human beings.

In fact, since Dr. Elias A. Zerhouni, former Director of the NIH, published his call to action, “Translational and Clinical Science – Time for a New Vision” in 2005, it has become increasingly important to ensure that discoveries are ‘translated’ into practical applications or policies for the benefit of the citizenry.

Biomedical research is often divided into two general areas:

- **Basic or “bench”** – research that is carried out to increase understanding of fundamental principles and mechanisms, which may or may not have an immediate practical applicability (e.g., the care of patients or the commercialization of product)
- **Clinical or “bedside”** – research that either directly involves a particular person or group of people, or uses materials from humans, such as their behavior or samples of their tissue, and that can be linked to a particular living person

However, this classification of biomedical research is overly simplistic. Basic researchers can use human-derived tissues, albeit from individuals or persons to whom this research cannot be linked (e.g., HeLa, H295R, or 3T3 cells). Or they can use animal or yeast cells, or other non-human cells, tissues, and models as they attempt to discover fundamental aspects of how our biology and disease processes work.

And clinically applicable research (often called in NIH jargon “patient-oriented” research) often involves “bench” (laboratory) work using human tissues. Or it may be “bedside,” i.e., the study of sick patients, who may be, but most often are not, hospitalized. And it may also involve the study of healthy individuals, or may focus on the study of therapies, as in clinical trials, or the development of new technologies, i.e., biomedical technology.

Clinical research can also focus on the study of individuals in their habitat or of communities at large. In fact, community-based research is critical to our ability to develop strategies that will improve the health of populations. Other types of clinical research seek to identify the most effective and most efficient interventions, treatments, and services, such as **outcomes, competitive effectiveness, and health services research**. And many public health investigators will use epidemiologic approaches to their analyses. Finally, much of what is implemented needs to be tied to improved health policy and to the commercialization of those life-improving or life-saving discoveries.

However, clinical research is not simply “clinician-assisted basic science.” While basic and clinical researchers follow the same general precepts of scientific thinking and hypothesis generation, they use very different tools and strategies. Why? Because clinical researchers work:

- With humans, who have free will and variable compliance
- With humans, who have a greater degree of genetic and environmental variability than animal or cellular models
- With disorders that may be rare or for which animal models may not exist or are imperfect or that may be heterogeneous and syndromatic
- In a much more regulated and policed research environment
- With greater risk, where if errors occur or subjects die, you cannot simply reorder mice or thaw a new batch of cells

The well-trained and skilled clinical researcher, who is often, but not always, a clinician-scientist, needs to be able to understand, and adjust, and strategize for, these conditions. And that requires training and experience. These individuals are not simply clinicians with an interest in a clinical problem or a desire to collaborate. These are individuals carefully trained to do the same thing basic scientists do, but working with a more challenging, yet directly relevant, model. These types of scientists are a rare breed.

What is translational research?

It is often assumed that ‘translational’ research is simply the transfer or application of concepts developed during “bench” or basic science to the “bedside.” A one-way street from the laboratory to the patient.

In fact, “basic” and “clinical” investigation simply represents part of the full spectrum that is biomedical and health-related research.

Translational research is much more than a one-way street. It is, and should be, a *two-way street* connecting the various parts of the biomedical research continuum, and simultaneously engaging investigators of all skills and approaches: basic scientists, clinician-scientists, epidemiologists, community-based investigators, technology transfer and health policy experts, clinical trialists and so on.

And what is a translational scientist? In some cases these are clinical researchers who have identified a clinical problem, or physiologic or pathophysiologic finding, and reach into the basic arena to begin to develop a better understanding of mechanisms, determinants and new molecular approaches, optimally in collaboration with a solid basic scientist. Or they can be basic scientists, who reach out to their clinical research colleagues for collaboration and partnership. And most rarely, they are individuals skilled as “translators.” Individuals who are trained to identify the connections between all parts of the scientific “house.” These individuals can be found most often in successful technology transfer operations.

The complexity and richness of the biomedical research continuum necessitates recognizing the need for well trained and brilliant basic and clinical researchers, as well as the need to create an environment that fosters and facilitates collaboration among basic, translational, clinical, and community-based scientists to the fullest extent.

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