



Research: The Search for Knowledge

Research of the natural world contributes to our knowledge and increased comprehension of our existence and possibly wisdom.

In Medicine, the focus of research is largely centered on biomedical and public health research. The goal of the latter is to prevent disease while the goal of the former is to understand disease at both the visible and the molecular level. Thus, research is being conducted to improve surgical and other interventional methods to repair damaged tissue and to elucidate the molecular pathophysiology in the hope to discover better diagnostic modalities and better therapies. But, as we are beginning to realize that health outcome is by no means solely dependent on 'repairing the broken bone or the broken molecular pathways', research is also being conducted in various disciplines of the social sciences that may have once been considered peripheral to biomedical research, such as the economics of medicine, law and medicine, medical education and medical humanities. This article is a short primer on areas of biomedical research.

Biomedical research is generally divided into basic research and applied research. Both are steeped in the scientific method. The scientific method entails that the inquiry is based on a working hypothesis that can be tested. Testing involves the collection of data that can either prove or disprove the hypothesis. A hypothesis is typically developed based on observations that cannot be readily explained. Once a theory of the mechanism to explain this observation is developed, data is collected that either supports/proves the hypothesis or disproves it. Thus, the scientific method involves observation, hypothesis development and the design of data collection methods. The preeminent data collection method is the experiment. Experiments are designed to test one variable in support of the underlying working hypothesis. Retrospective chart reviews are an important experimental methodology in biomedical research that can provide data to prove or disprove a working hypothesis.

Basic Science Research: The goal of basic science research is to contribute to our fundamental understanding of the natural world. It provides the basic knowledge on which further hypothesis or objectives are based and guidance to ask and address specific question.

Applied Research: The goal is to address specific problems. Applied research encompasses clinical and translational research.

Translational Research: The goal of translational research is to develop novel solutions designed to cure or improve a hitherto incurable illness. The hallmark difference to basic science is that it is being conducted by an interdisciplinary team that moves the research from 'bench to bedside'. Importantly though, it also involves the reverse: to find the basic science mechanisms that explain a clinical observation.

Clinical Research: The goal of clinical research is to test the efficacy and safety of new interventions including drugs. This is typically accomplished through incremental clinical trials, whereby phase I trials determine safety, phase II trials determine efficacy and phase III determine efficacy in a larger cohort, typically through a randomized control multicenter trials.