



Chapter 01/ Capítulo 01

Evidence-based biomedicine: methodology for research, standardization, and scientific procedural aspects (English Edition)

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Clinical Research: Composition of Multidisciplinary Research Teams / Investigación Clínica: Composición de Equipos Multidisciplinarios de Investigación

Modern clinical research has evolved toward a more integrative, collaborative approach, reflected in the growing importance of multidisciplinary research teams.

These teams bring together professionals from various disciplines, each contributing unique knowledge and skills that are crucial to the success of clinical research. The composition of these teams varies depending on the project and specific objectives. Generally, it includes physicians, nurses, pharmacists, statisticians, and often professionals from other areas such as psychology, sociology, and bioethics.

At the heart of these teams are physicians and clinical researchers who contribute their expertise in diagnosing and treating diseases, as well as in conducting clinical trials. They work closely with nurses and other healthcare professionals who offer in-depth knowledge of patient care and health management in the clinical setting. These professionals are essential to the implementation and practice of the research protocol and to ensure that patient care remains a top priority.

Pharmacists bring a detailed understanding of pharmacology and medication management, which is vital for studies that develop and test new drug therapies. They ensure that medication administration and monitoring are carried out safely and effectively, and they also contribute to the interpretation of pharmacotherapy results. Statisticians, on the other hand, play a fundamental role in the design, planning, and analysis of the data collected in the study. Their ability to interpret complex data and ensure the statistical validity and reliability of the findings is indispensable for drawing accurate and reliable conclusions from the research.

In addition, the inclusion of experts in bioethics and health law is increasingly common, especially in studies exploring new or ethically complex medical territories. These professionals ensure that research is conducted in accordance with the highest ethical and legal standards, protecting the rights and well-being of study participants. They may also address issues related to informed consent and data privacy. Finally, collaboration with sociologists, psychologists, and other specialists in the social and behavioral sciences can enrich clinical research by providing insights into the social, psychological, and cultural factors that may influence patients' health and behavior. This multidisciplinary integration facilitates a more comprehensive understanding of health issues and contributes to the development of more effective, personalized intervention strategies.

In summary, multidisciplinary teams in clinical research represent a holistic, collaborative approach essential to addressing the complexity of today's health problems. The combination of skills and knowledge from diverse disciplines enhances the quality and effectiveness of research, ultimately leading to better healthcare outcomes and advancing medical knowledge.

1.1. Research and health

The interaction between research and health is a fundamental pillar of modern medicine, where clinical practices and scientific knowledge intertwine to improve patient care and

understanding of various diseases continuously. Clinical practices are based on scientific knowledge accumulated through rigorous research, trials, and studies. This knowledge is not static, but constantly evolving as new research provides more data and perspectives. The definition of scientific knowledge in the field of health implies an understanding based on evidence obtained through systematic, replicable methods, subject to review and criticism by the scientific community.

Reproducibility is a crucial aspect of medical research. It means that the results of a study must be replicable when the same experiment or research is conducted under similar circumstances. Reproducibility ensures the reliability of findings and is a cornerstone of scientific knowledge. However, reproducibility in clinical research can be challenged by a variety of factors, including biological variability, differences in research methodologies, and data interpretation.

The factors that influence health are numerous and range from genetic and biological elements to environmental and social influences. These factors include, but are not limited to, genetics, individual behavior, access to healthcare, environmental conditions, and social determinants such as education, employment, and socioeconomic conditions. Understanding how these factors interact and affect health is essential for developing effective prevention and treatment strategies.

Health research is, therefore, a constant search for rational answers to complex questions about diseases, treatments, and health factors. It uses methods that scientists use to investigate hypotheses and theories, contributing to a body of knowledge that supports clinical and health policy decision-making. Through research, new diseases can be identified, innovative treatments developed, prevention practices improved, and health resource management optimized.

In addition, health research focuses not only on finding cures for diseases, but also on better understanding how to promote and maintain health and well-being. This includes research in public health, nutrition, exercise, mental health, and disease prevention. By approaching health holistically, research helps create more efficient and effective health systems capable of responding not only to specific diseases but also to the health needs of the general population.

In short, the relationship between research and health is dynamic and multifaceted. Clinical practices informed by robust, continually evolving scientific knowledge are essential to providing quality care. Health research is an indispensable tool for understanding and improving human health, ranging from the study of molecular and cellular mechanisms to the evaluation of population-level interventions. This relentless pursuit of knowledge and answers drives continuous progress in medicine and health.

1.2. Health sciences

Health sciences, a broad and diverse field, encompasses the study of all aspects of health, disease, and healthcare. At their core, the methods employed in health sciences are varied and multidisciplinary, reflecting the complexity and multifaceted nature of the topics they address. These methods range from experimental and quantitative approaches to qualitative research and field studies, each with its own strengths and specific applications.

In the experimental realm, health sciences frequently use clinical trials and laboratory studies to investigate the effects of medications, treatments, and other health factors. These

trials are fundamental to validating new treatments and therapies. They are carefully designed to ensure validity and reliability, often using randomization and control groups to minimize bias and obtain objective results.

On the other hand, quantitative methods include statistical data analysis, which is crucial in assessing disease patterns, treatment outcomes, and other health indicators in large populations. These methods allow researchers to identify trends, correlations, and possible causes of health problems, providing a solid basis for health policy formulation and clinical decisions.

In contrast, qualitative approaches in health sciences focus on understanding human experiences, attitudes, and behaviors related to health. Through interviews, studies, case studies, and observations, researchers can gain a deeper understanding of the social, cultural, and psychological factors that influence health and well-being. This approach is particularly valuable for exploring areas that are difficult to quantify, such as quality of life, patient experiences, and ethical aspects of healthcare.

In addition, research methods in the health sciences often include field studies and epidemiology, which are essential for understanding how diseases spread and how they can be prevented or controlled. These studies can range from infectious disease surveillance to outbreak investigation and public health program evaluation. The combination of these diverse methods enables scientists and health professionals to address the complex, ever-changing challenges in health comprehensively.

1.3. Healthcare as a science

Healthcare, understood as a science, is based on the rigorous application of research methods and scientific principles to improve the health and well-being of individuals and communities. This scientific perspective on healthcare encompasses a wide range of disciplines, from biology and medicine to psychology and sociology, all of which contribute to a comprehensive understanding of human health and disease. At the heart of healthcare as a science is a commitment to research-based evidence, which guides clinical decisions, health policies, and disease prevention strategies.

A fundamental aspect of healthcare as a science is biomedical research. This field is dedicated to understanding the biological and physiological mechanisms underlying disease and to finding new ways to diagnose, treat, and prevent disease. Biomedical research uses advanced techniques, such as genomics, proteomics, and bioinformatics, to discover new therapeutic targets and develop innovative drugs and therapies. These scientific advances not only improve patient care but also expand our knowledge of how the human body works.

Epidemiology is another crucial discipline in healthcare as a science. It focuses on the study of the distribution and determinants of health-related states or events in specific populations, and the application of this study to control health problems. Epidemiologists investigate disease patterns, identify risk factors, and evaluate public health intervention and prevention strategies. Their work is essential for understanding and controlling disease outbreaks, as well as for identifying health trends and environmental or behavioral factors that may affect health.

Healthcare also benefits from research in the behavioral and social sciences. These fields explore how psychological, social, and cultural factors influence health and individual behavior.

For example, health psychology studies how behavior and lifestyle affect physical health, while health sociology examines the impact of social and economic factors on well-being. This multidimensional understanding is crucial for designing effective interventions that address not only the biological aspects of disease, but also behavioral and social factors.

Technology also plays an increasingly important role in healthcare as a science. Technological innovation has led to more accurate diagnostic tools, advanced medical devices, and health information systems that improve the efficiency and effectiveness of medical care. Telemedicine, digital health, and artificial intelligence are transforming how healthcare is delivered, enabling remote patient monitoring, analyzing large volumes of health data, and personalizing medical care.

Finally, ethics in healthcare is a crucial scientific consideration. As we advance in our ability to treat diseases and modify biological aspects of human beings, important ethical questions arise about privacy, consent, equity in access to treatments, and the long-term implications of medical interventions. Bioethics provides a framework for addressing these issues, ensuring that scientific advances are made responsibly and with respect for individuals' rights and dignity.

Taken together, these aspects demonstrate that healthcare is a complex and multifaceted science that requires a multifaceted approach.

An interdisciplinary and evidence-based approach to continuously improve the health and well-being of people around the world.

1.4. Combining research and healthcare activities

The combination of research and healthcare activities in the field of health is an integrative approach that seeks to improve the quality and effectiveness of medical care. This synergy between research and clinical practice is fundamental to advancing medicine, as it enables scientific findings to be directly applied to patient care. Healthcare professionals who participate in research can bring deeper and more up-to-date knowledge to their clinical practice, thereby improving patient health outcomes.

This integrative approach also fosters a culture of continuous learning and constant improvement in the healthcare environment. Physicians, nurses, and other healthcare professionals stay abreast of the latest developments in their field, enabling them to apply the most advanced techniques and treatments. In addition, participation in research can help healthcare professionals develop a deeper understanding of the challenges and limitations of their practice, which in turn can inspire new questions and areas of study.

Collaboration between researchers and healthcare professionals also facilitates the conduct of clinical studies and data collection in real-world healthcare settings. This is vital to ensuring that research findings are applicable and relevant to everyday clinical practice. Patients benefit directly from this approach, as they have access to the latest treatments and care and, in some cases, can participate in clinical trials offering new therapies.

In addition, the union of research and healthcare practice enables better evaluation of treatment effectiveness across a variety of settings and populations. Research findings can be quickly integrated into clinical practice guidelines, ensuring that patients receive care based

on the best available evidence. This not only improves health outcomes but also enhances efficiency in resource use in the healthcare system.

Finally, integrating research and healthcare is essential to addressing the complex health needs of populations. It enables professionals and researchers to understand better the dynamics of disease, risk factors, and effective interventions across diverse sociocultural and economic contexts. This is particularly important in the era of personalized and precision medicine, where the goal is to tailor treatments to each patient's individual characteristics.

In summary, the union of research and healthcare in the field of health is a crucial approach to advancing modern medicine. By combining clinical experience with research, the quality of medical care improves, innovation is fostered, and patients receive the most effective and up-to-date treatments. This integrative approach is essential for addressing current and future health challenges, improving outcomes for patients and communities globally.

1.5. Conceptualization of clinical research

Clinical research is a fundamental pillar of medicine, focusing on improving knowledge and understanding of diseases, developing more effective treatments, and advancing healthcare. This discipline encompasses a wide range of activities, from studying the basic biology of diseases to conducting clinical trials to test the efficacy and safety of new treatments and therapies. At its core, clinical research is the process by which scientific hypotheses and medical observations are turned into practical applications that can improve the health of individuals and communities.

One of the key components of clinical research is the clinical trial. This meticulously controlled research study evaluates the safety and efficacy of a drug, medical device, diagnostic, or therapeutic intervention. These studies are vital to the drug and therapy development process, as they provide critical data on their performance in real-world situations.

Clinical trials are conducted in phases, each designed to answer different questions about the product or intervention under study. They are essential to ensuring that any new treatment is both safe and effective before it is approved and widely used. Clinical research also focuses on epidemiology, which studies the distribution, causes, and effects of health conditions and diseases in specific populations.

This branch of research is crucial for identifying risk factors, disease patterns, and potential prevention and control strategies. By analyzing large datasets and observing trends over time, epidemiologists can provide valuable information for public health decision-making and health policy formulation.

In addition, clinical research involves the study of the pathophysiological mechanisms of disease. This aspect, often referred to as translational research, seeks to understand how observations and discoveries made in the laboratory can be applied to the prevention, diagnosis, and treatment of diseases in the clinical setting. This approach helps bridge the gap between basic research and patient care, accelerating the conversion of new scientific discoveries into clinical applications.

Another important area of clinical research is the study of health outcomes and quality of

life. Here, researchers focus on evaluating how diseases and treatments affect patients' lives, considering not only medical outcomes but also psychological, social, and economic impacts.

This approach is essential for developing comprehensive care strategies that address all aspects of patient well-being.

In summary, clinical research is a multidimensional field that ranges from the study of the biological bases of diseases to the evaluation of therapeutic interventions and their impact on public health. It is a dynamic, constantly evolving discipline, driven by the goal of improving patient care and global population health. By integrating research with clinical practice, clinical research plays a crucial role in advancing medicine and continuously improving health care standards.

1.6. Role of health and healthcare professionals in research

The role of healthcare professionals in research is crucial and multifaceted, advancing medicine and improving patient care. These professionals, including doctors, nurses, pharmacists, and other healthcare specialists, are often the first to identify clinical research needs based on their direct patient care experience. Being on the front lines of healthcare, they have a unique perspective on diseases, their treatments, and the challenges patients face, enabling them to generate relevant and practical research questions.

In clinical trials, healthcare professionals play an essential role in the implementation and management of these studies. They are responsible for recruiting participants, administering treatments or interventions, and collecting data. Their clinical expertise is invaluable in ensuring that trials are conducted ethically and safely, always respecting the rights and well-being of patients. In addition, their clinical knowledge helps interpret trial results, ensuring that conclusions are relevant and applicable to clinical practice.

Healthcare professionals also contribute significantly to translational research, which applies basic research findings to benefit patients directly. Understanding the complexities of disease in the clinical context can guide research from the laboratory to practical applications in disease treatment and prevention. This collaboration between researchers and clinicians is essential to accelerate the development of new therapies and improve health outcomes.

In addition, healthcare professionals play an important role in public health research and epidemiological studies. Their knowledge and experience are essential for identifying disease patterns and risk factors, as well as evaluating the effectiveness of public health programs. Through their work, they can influence the formulation of health policies and the implementation of disease prevention and control strategies at the community level.

Finally, health and healthcare professionals are key to research on health outcomes and quality of life. Their understanding of the impacts of diseases and treatments on patients' daily lives enables them to address issues such as patient satisfaction, treatment adherence, and quality of life. This is especially important in the era of personalized medicine, where care is tailored to each patient's individual needs.

In summary, the role of healthcare professionals in research is integral, spanning from formulating research questions to implementing and applying research findings. Their

contributions not only drive scientific advancement in medicine but also ensure that this progress translates into concrete improvements in patient care and population health. Their role is therefore indispensable in the ongoing effort to better understand disease and improve healthcare worldwide.