ALMUSTAQBAL UNIVERSITY

College of Health and Medical Techniques
Medical Laboratory Techniques Department

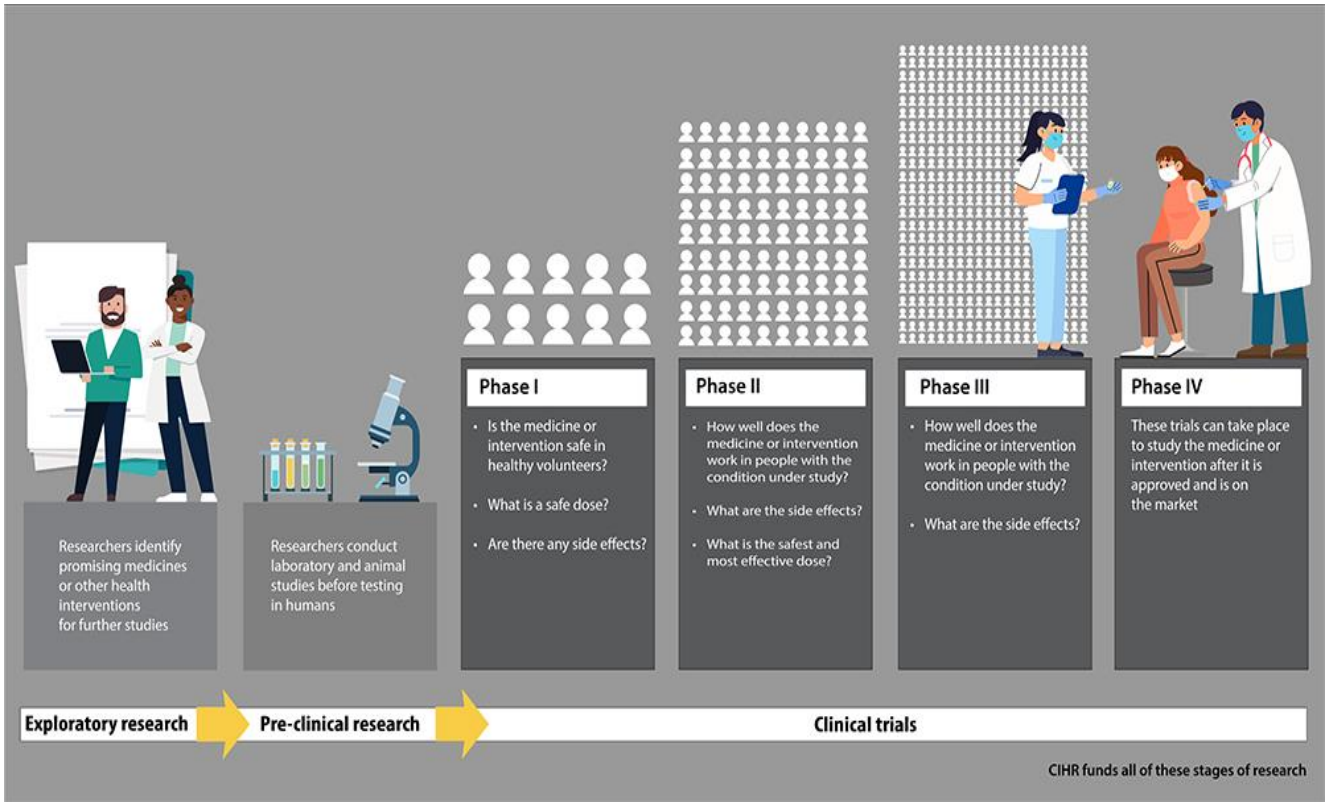
Stage : Fourth year students
Subject : Research Methods - Lecture 5

Lecturers:

Professor Dr Mahdi A. Abed

Assistant professor Dr. SADIQ . J. BAQIR

Clinical Trials



Clinical trials are an essential part of the drug development process and are designed to evaluate the safety and efficacy of new treatments before they are approved for use by regulatory agencies. Clinical trials involve a series of tests and evaluations that are conducted in humans to determine whether the new .treatment is safe, effective, and offers benefits over existing treatment

What are Clinical Trials?

Clinical trials are research studies which evaluate medical interventions through human participant involvement to test new treatments, medical devices, and diagnostic tools. These studies are conducted to evaluate the safety, efficacy, and tolerability of the new treatment in humans. Clinical trials are an essential component of the drug development process, and they are required for regulatory approval of new treatments.

Clinical trials serve as research studies which evaluate medical and behavioral interventions through human participant involvement

How do Clinical Trials Work?

Clinical trials involve several phases, each with its specific purpose. The different phases of clinical trials are designed to evaluate the safety, efficacy, and tolerability of the new treatment in humans. There are four phases of clinical trials, each with its own specific purpose .The phases of clinical trials vary in sample size, duration, and design, depending on the research question being addressed.

Phases of clinical trials:

Phase 0: Exploratory Studies

The main goal is to see how the new drug behaves in the body — especially how it is absorbed, distributed, metabolized, and excreted. This is also known as studying the pharmacokinetics and pharmacodynamics.

- **Pharmacokinetics (PK):** How the body processes the drug
- **Pharmacodynamics (PD):** How the drug affects the body

Phase I Trials: Safety Trials

Phase I trials are the first stage of clinical trials, and they involve a small group of healthy volunteers. **The primary objective of Phase I trials is to evaluate the safety and tolerability of a new treatment**. The researchers will use this phase to establish a safe dosage range and monitor any side effects that may occur. This phase also helps to understand how the drug behaves inside the human body in real time.

Focus Areas:

- Establishing maximum tolerated dose (MTD)
- Identifying adverse reactions
- Determining pharmacokinetics (absorption, metabolism, etc.)
- Route of administration: oral, intravenous, etc.

Phase I trials typically involve 10 to 100 participants, and the sample size is determined based on safety considerations. Since the focus of Phase I trials is on safety, the sample size is relatively small, and the trial duration is relatively short.

Phase II Trials: Efficacy and Side Effects

- **Efficacy**: Does the drug do what it's supposed to?
- **Side Effects**: Are they mild, moderate, or severe?
- **Dosing Schedules**: Once a day vs. twice, etc.

Phase II trials are the second stage of clinical trials, and they involve a larger group of patients with the targeted disease or condition. To determine if the treatment is effective for a particular condition, and to monitor safety and adjust dosing **The primary objective of Phase II trials is to evaluate the efficacy and safety of the new treatment.**
Phase II trials typically involve 100 to 300 participants, and the sample size is determined based on efficacy and safety considerations. The trial duration in Phase II is longer than Phase I and the sample size is larger since the focus is on efficacy in addition to safety.

Phase III Trials: Confirmation and Comparison

Phase III trials are the third stage of clinical trials, and they involve a larger group of patients than Phase II**.** To confirm the treatment's effectiveness, compare it with the existing standard therapies, and gather detailed information on risks and benefits monitoring for less common side effects**.** Data is used for submission to Food and Drug Administration (**FDA)** , Agency of the US Department of Health and Human Services or European Medicines Agency (**EMA**) , and other authorities for approval.

The primary objective of Phase III is to confirm the safety and efficacy of the new treatment in a larger population. Phase III typically involve

hundreds or thousands of participants, and the sample size is determined based on statistical calculations. The trial duration in Phase III is longer than Phase II, and the sample size is much larger since the focus is on demonstrating that the new treatment offers benefits over existing treatments and is safe and effective.

Phase IV Trials: Post-Marketing Surveillance

Phase IV trials are conducted after the new treatment has been approved for use by regulatory agencies and available to the public .**These trials are designed to gather additional information about the long-term safety and efficacy of the new treatment and to identify any rare or unexpected side effects**. The sample size for Phase IV varies depending on the research question being addressed. Some Phase IV may involve thousands of participants, while others may involve only a few hundred. The trial duration in Phase IV is typically longer than Phase III since the focus is on long-term safety and efficacy.

Sample size is a critical consideration in clinical trial design since it determines the statistical power of the study to detect meaningful differences between treatment groups. Understanding the phases of clinical trials and their sample size requirements is essential for designing and conducting clinical trials effectively.

Understanding the Flow of Clinical Trials: Phases and Objectives

- Clinical trials begin with the preclinical phase (**phase 0**), in which the new treatment is tested in the laboratory and in animal models to evaluate its safety and efficacy.
- Once preclinical testing is completed, the new treatment moves to Phase I clinical trials, which involve a small group of healthy volunteers.
- **The primary objective of Phase I trials is to evaluate the safety and tolerability of the new treatment**.
- If the results of Phase I trials are promising, the new treatment moves to Phase II clinical trials, which involve a larger group of patients with the targeted disease or condition.
- The primary objective of Phase II trials is to evaluate the **efficacy and safety of the new treatment.**
- If the results of Phase II trials are promising, the new treatment moves to Phase III clinical trials, which involve a much larger group of patients than Phase II trials.
- The primary objective of Phase III trials is **to confirm the safety and efficacy of the new treatment in a larger population.**
- If the results of Phase III trials are positive, the new treatment may be submitted for regulatory approval.
- Once the new treatment is approved, it may move to Phase IV clinical trials, which **are conducted to gather additional information about the long-term safety and efficacy of the new treatment**.
- Throughout all phases of clinical trials, data is collected, analyzed, and reviewed by an independent review board to ensure that the study is conducted ethically and that the results are valid and reliable.
- **The ultimate goal of clinical trials is to ensure that new treatments are safe and effective and that they offer benefits over existing treatments**.

The total time it takes to complete a clinical trial varies depending on the phase of the trial, the complexity of the disease or condition being studied, and the availability of eligible participants. Generally, clinical trials can take several years to complete, with each phase taking anywhere from several months to several years.

Phase I trials typically last several months to a year, while Phase II trials can last one to two years. Phase III trials can take several years to complete since they involve a larger number of participants and require longer follow-up periods.

The time it takes to complete a clinical trial can also be affected by other factors such as challenges, funding availability, and unexpected safety or efficacy issues that may arise during the trial. Overall, the entire process of developing and approving a new treatment can take up to a decade or more, depending on the complexity of the disease and the number of clinical trials required.

In conclusion, clinical trials are important component of the drug development process, and they play a critical role in evaluating the safety and efficacy of new treatments. The different phases of clinical trials, each with its specific purpose and sample size requirements, ensure that new treatments are thoroughly evaluated before they are approved for use by regulatory agencies. Clinical trials also optimize interventions by determining the most effective dosage, treatment duration, and administration route, tailoring treatments to individual needs.