Drug Discovery of Small Molecules

55-MINUTE ONLINE COURSE | LEVEL 1

OVERVIEW

Drug Discovery of Small Molecules explains the steps involved in discovering new therapeutics. This process includes early screening for targets, target validation, lead optimization, and determining when a target should be transitioned from discovery to development. Learn how new drugs are discovered and optimized prior to being tested in preclinical and clinical trials.

Five Takeaways:

1. List and describe the steps of the drug discovery process
2. Define or describe what is a drug and typical discovery platforms
3. Describe target identification and validation processes and screening considerations for drug candidate selection.
4. Explain lead optimization activities, and
5. Discuss typical criteria for advancement of development candidates.

AGENDA

- **Drug Discovery Overview** explains the steps involved in drug discovery and how drug discovery fits into the entire process of bringing a new therapeutic to market.
- **Early Screening** defines the term drug and describes some common drug discover platforms, explains target identification processes and screening considerations, and discusses the need for high throughput screening of molecules in drug discovery.
- **Target Validation** defines target validation processes and target selection and discusses some common questions that need to be answered with regard to target-drug interactions.
- **Lead Optimization Criteria** explains lead optimization activities describes examples of drug design methods and approaches, explains ADMET, and gives an example of a screening pathway.
- **Discovery To Development** lists the typical criteria for advancement of potential drug development candidates.

Preclinical Development for Small Molecules

55 MINUTES ONLINE COURSE | LEVEL 1

OVERVIEW

Preclinical Development For Small Molecules course defines the safety assessment, regulatory requirements and how clinical starting dose levels are estimated. Learn what preclinical criteria is needed to support first in human clinical trials.

Five Takeaways:

1. List and describe the steps of the preclinical drug development process
2. Define or describe preclinical functions, the animal rule and their contribution to enable clinical trials
3. Explain safety assessment and how clinical starting dose levels are estimated
4. Explain the integration of preclinical data and the Common Technical Document
5. Discuss the typical criteria for supporting first in human clinical trials

AGENDA

- **Overview** describes the major drug development steps and the timing and costs involved in developing drugs in various regions of the world. Additionally, this section defines the industry average of molecules that progress through each stage of development and discusses typical data and data sources used in nonclinical development.
- **Pharmacology** defines pharmacology, discusses the key data generated during pharmacology studies, and describes its contribution to moving from preclinical to clinical trials. Furthermore, this section explains two different types of drugs, antagonists and agonists, and discusses the importance of clinical product design and animal models in support of drug development.
- **Pharmacokinetics** describes how pharmacokinetics are used to characterize the exposure-response relationship for a drug candidate, discusses the typical endpoints calculated, lists and describes the Good X Practices (GXPs), defines bioanalytical assays and validation criteria, and finally explains the differences between pharmacokinetics and pharmacodynamics.

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- **Toxicology** defines toxicology and describes its importance in selecting compounds and establishing safety during drug development, and discusses typical approaches and criteria used in toxicity studies to support drug candidate progression to clinical trials including determining dose level selection, routes of administration, and species selection. Finally, this section explains therapeutic margins, adverse effects, and the subjectivity in making conclusions based on sample study data.
- **Nonclinical IND/CTA** lists the sections of the common technical document that should contain nonclinical data and defines the animal rule and its advantages in drug development.

Clinical Development 101: General Principles

55-MINUTE ONLINE COURSE | LEVEL 1

OVERVIEW

Clinical Development 101: General Principles sets the stage for the entire clinical development process. Learn who conducts trials, how trials are conducted and the various regulatory elements that must be performed throughout Phases I-IV trials.

Five Takeaways:

1. Describe the purposes for which clinical studies are conducted
2. Define the common clinical trial terms such as control groups, bias, blinding, randomization, and endpoints
3. List the basic elements of parallel, crossover, and natural history clinical trial designs
4. Describe the basic steps in conducting a clinical trial
5. List the various clinical trial participants and their roles

AGENDA

- **Clinical Development Introduction** describes the key milestones for drug development, specifically focusing on clinical development. Important terms including evidence-based medicine, translational medicine, and patient-centric clinical trials are explained. Finally, the purposes for which clinical trials are conducted are explored.
- **Clinical Trials: Basic Principles** explains how risk management is approached in terms of scientific method, Good Clinical Practices (GCPs), and trial design (including parallel, crossover and natural history). Bias, blinding, randomization and endpoints are all critical concepts that are explained in detail.
- **Conducting Clinical Trials** lists the various clinical trial participants and their roles (including ethics committees and IRBs), identifies the basics elements of a clinical trial protocol, describes informed consent, discusses inclusion/exclusion criteria, lists the steps in data management and reporting, and finally reviews the concept of clinical trial transparency.

Clinical Development 201: Phase I

50-MINUTE ONLINE COURSE | LEVEL 2

SUGGESTED PREREQUISITE: CLINICAL DEVELOPMENT 101

OVERVIEW

Clinical Development 201: Phase I explores the prerequisites, purpose, design, and conduct of Phase I trials. Topics such as bioequivalence, pharmacokinetics, pharmacodynamics, endpoints, selection of dose, and more are explained in detail.

Five Takeaways:

1. Describe the requirements for and maintenance of an Investigational New Drug (IND) application and a Clinical Trials Application (CTA)
2. Describe the purpose of, and characteristics of Phase 0 and Phase I clinical trials
3. Compare and contrast expectations related to clinical benefit in early clinical trials for a) standard development programs, and b) development of treatments for conditions associated with serious unmet medical needs
4. Describe typical endpoints assessed in Phase I clinical trials
5. Describe what steps take place at the conclusion of the clinical study

AGENDA

- **Clinical Trial Prerequisites** identifies the CMC, preclinical safety, and pharmacology prerequisites for entering early phase clinical trials. Learn the requirements needed for the IND application and how ethics committees and Institutional Review Boards (IRBs) must review the protocols prior to a drug entering humans for the first time.
- **Phase 0/I Study Designs and Objectives** describes the purpose of, and characteristics of Phase 0 and Phase I clinical trials and the general approach associated with bioequivalence studies. Compare and contrast the expectations related to clinical benefit in early clinical trials for a) standard development programs, and b) development of treatments for conditions associated with serious unmet medical needs.
- **Phase I Conducting the Clinical Study** explains how dosage is determined using maximum tolerated dose (MTD), single ascending dose (SAD), and multiple ascending dose (MAD), pharmacokinetics, and pharmacodynamics data. Become familiar with typical endpoints assessed in Phase I clinical trials and learn how and why clinical trial phases are sometimes combined. This section also describes the requirements for Clinical Trial Safety Reports associated with adverse events and what steps take place at the conclusion of the clinical study.

Clinical Development 301: Phase II/III

55-MINUTE ONLINE COURSE | LEVEL 3

SUGGESTED PREREQUISITES: CLINICAL DEVELOPMENT 101, CLINICAL DEVELOPMENT 201

OVERVIEW

Clinical Development 301: Phase II/III considers the purpose, design, and conduct of Phase II and III clinical trials. Learn the various trial design approaches, endpoint choices, statistical considerations, and special regulatory designations.

Five Takeaways:

1. Key differences between early stage (Phase I) and late-stage (Phase II/III) clinical trials
2. Compares and contrasts the regulatory significance of clinical endpoint, primary endpoint, secondary endpoint, surrogate endpoint
3. Fluency in Phase II and Phase III clinical trial nuances
4. Basic statistical analysis completed in late-stage trials
5. Description of specialized and expedited development cycles for rare disease, orphan drugs, and therapies for unmet medical needs

AGENDA

- **Phase II/III Introduction** identifies the principle elements of a well-controlled Phase I/II clinical trial with an in depth look at study design, endpoints, and statistical analysis. The concepts of a null hypothesis, p-value, type 1 error, type 2 error, power, variability, and treatment size effects are explained in detail.
- **Phase II/III Objective and Design** compares the general characteristics of Phase II and Phase III clinical trials. Learn what it means when you hear the terms pivotal study, adaptive trial, basket trial, and umbrella trial. Lastly, understand the function and types of recommendations the Data Safety Monitoring Boards provides.
- **Phase II/III Special Designations** focuses rare disease and serious unmet medical need designations in both the US and Europe. This section explains the challenges associated with clinical studies associated with rare disease and provides examples of flexible clinical development approaches for application to rare diseases. Lastly, the relationship between clinical trial endpoints and approved labeling claims are explained.

Clinical Development 401: Phase IV

50-MINUTE ONLINE COURSE | LEVEL 3

SUGGESTED PREREQUISITES: CLINICAL DEVELOPMENT 101, CLINICAL DEVELOPMENT 201, CLINICAL DEVELOPMENT 301: PHASE II/III

OVERVIEW

Clinical Development 401: Phase IV Studies, Pharmacovigilance and Real-World Evidence surveys the ongoing post-approval clinical assessments required by regulatory agencies. Learn how drug risk management is accomplished through detecting, assessing and reporting adverse effects using real-world data.

Five Takeaways:

1. Purpose of Phase IV studies
2. Key limitations of pre-market studies and why post-market studies are an important complement to Phase I-III studies
3. Role of regulatory safety information reporting programs including MedWatch in US and EudraVigilance in Europe
4. In depth look at Real-World Data (RWD) and Real-World Evidence (RWE) and their impact on safety
5. Identification of important real-world data sources

AGENDA

- **Phase IV Studies** explains the purpose of Phase IV studies and takes in-depth look at numerous study examples including long-term safety and pharmacoeconomic studies.
- **Pharmacovigilance and Post-Marketing Safety Follow-Up** explains important regulatory terms such as pharmacovigilance, safety signal, signal detection and signal analysis. The purpose of regulatory safety information reporting programs such as MedWatch in US and EudraVigilance in Europe is thoroughly reviewed. The section ends by describing the post-marketing regulatory actions that may be taken in response to emerging knowledge of safety risks.
- **Real-World Evidence** discusses how regulatory authorities, such as FDA, are increasingly using real-world evidence to improve regulatory decisions. Important sources of real-world data are identified.