Shree H. N. Shukla Institute of Pharmaceutical Education and Research, Rajkot

B. Pharm
Semester-VII

Subject Name: Industrial Pharmacy-II
Subject Code: BP702TT

CHAPTER -3 REGULATORY AFFAIRS & REGULATORY REQUIREMENTS FOR DRUG APPROVAL

SYLLABUS: Introduction, Historical overview of regulatory affairs, Regulatory authorities, Role of regulatory affairs department, Responsibility of regulatory affairs professionals.

Syllabus Topic: Introduction

The present scenario of the pharmaceutical industry is very well co-ordinated, efficient and docile as per international standards for the manufacturing of various types of Biological and Chemical drugs (which also include medical devices, traditional herbal products and cosmetics) used for the human consumption and veterinary purpose. Various challenges faced by the regulatory system result into current well-defined controlled regulatory framework. The impact of this framework consequences into systematic manufacturing and marketing of safe, effective and qualitative drugs. With the vast growth of pharmaceutical industry, the legislations from each region have become more and more complicated and created an urgent need for regulatory professionals.

Regulatory affairs is a dynamic and challenging profession which is developed from the desire of governments and act as an interface between the pharmaceutical company and the regulatory agencies in order to ensure public health by controlling the safety and efficacy of products in areas including pharmaceuticals, veterinary medicines, medical devices, pesticides, agrochemicals, cosmetics and complementary medicines.

Syllabus Topic: Historical Aspect

During 1950s, multiple tragedies i.e. sulfanilamide elixir, vaccine tragedy and thalidomide tragedy have resulted in substantial increase of legislations for drug products quality, safety and efficacy. This leads to tightening of norms for Marketing Authorization (MA) and Good Manufacturing Practices (GMPs).
The drug industry in India was at very primitive stage till 20th century. Most of the drugs were imported from foreign countries.

(a) 1900-1960:
Government passed the Poisons Act, 1919 to check and hold the control on cheap drugs available in market. This Act helps in the administered possession of substance or sale of substances as specified as poison. It also stated the safe and protected custody of the poisons, packaging and labeling of poisons, maximum quantity to be sold and inspection as well as examination of the poison sold by vendor during the year.

The Poisons Act was followed by The Dangerous Drugs Act, 1930 which includes the regulation of cultivation, manufacturing, possession and trade of opium.
In 1985, Dangerous Drugs Act, 1930 and Opium Act, 1878 was revoked by passing of the Narcotics and Psychotropic Substances Act.

Following acts and rules were passed during this era:

• Drugs and Cosmetics Act, 1940: This act regulates the manufacturing, distribution, import and sale of allopathic, homeopathic, unani and siddha drugs.

• Drugs and Cosmetics Rules, 1945: This act regulates manufacture of Ayurvedic drugs for sale only, and not for consumption and use or possession.

• Pharmacy Act, 1948: This law was amended in 1986 and it generally controls and regulates the profession of pharmacy in India.

• Drugs and Magic Remedies (Objectionable Advertisements) Rule, 1955: This rule regulates the advertisement of drugs in India.

• Drugs Prices Control Order, 1955 (DPCO) (under the essential commodities Act): DPCO was further amended in 1995. As per this rule, government has a jurisdiction to review and fix maximum sale price for bulk drugs as well as formulation.

(b) 1960-1970:

The Indian Pharmaceutical industry was not mature enough and major market share was dominated by MNC and very few Indian manufacturers were in competition. Focus on pure research and development was very little because of deficiency of patent protection. The low availability and high drug price is because majority shares depend upon the high drug import.

(c) 1970-1980:

Government took control for the medicines regulation and issued few acts and rules.

• Indian Patent Act 1970 (which came in force on 20 April 1972 and replaced Indian Patents and Designs Act of 1911): It serves as the basis for patent protection in India.

Under this Act, product patent was not allowed but the process and method of manufacturing of Drug substance was allowed to get the patent.

• Drug prices capped: Drug Prices Control Order (DPCO) was introduced to control the high price against consumers.

(d) 1980-1990:

The Indian industry has started investing in process development of API and created production infrastructure for the same.

(e) 1990-2000:

A rapid expansion in domestic market has observed in pharmaceutical industry. The companies have started entering into Research and Development.

(f) 2000-2010:

This period is considered to be the Innovation and Research era. During these years, innovative research activity, patenting of the drugs formula, process, indication as well as merger of companies was started.

Patent Amendment Act 2005: Indian Government brought out the Patents (Amendment) Ordinance, 2004 to address the issues relating to the patent in the country which was later replaced by the Indian Patent (Amendment) Act, 2005. The new Act brought some crucial changes on the legal regime of patent protection so as to address patent issues in technology, chemicals and pharmaceuticals sectors.

Compulsory Licenses: Such licenses can be granted for manufacture and export of the drug products "to any country having insufficient or no manufacturing capacity, for the said product, to address public health problems".

Few names are given below:
• Drugs and Cosmetics (First Amendment) Rules, 2011: It mandates registration of Clinical Research Organization (CRO) for conducting Clinical Trials (CT).
• Clinical Trial Registry-India (CTRI): It has been set up by the ICMR's (Indian Council of Medical Research) National Institute of Medical Statistics (NIMS).
• Pharmacovigilance Program of India (PvPI): The Central Drugs Standard Control Organization (CDSCO) has launched Pharmacovigilance programme to assure drugs safety to Indian patients.

Syllabus Topic: Regulatory Authorities

The rules and regulations are being framed considering Global, Regional and National pharmaceutical trade as well as necessity of the drugs based on population of patient. Most of the national guidelines regarding the development and market authorization application of drug are based on Global and Regional Harmonized guidelines. Global Network regulatory is composed of the representatives of each country in the world. International Council for Harmonization (ICH) in collaboration with USA, EU and Japan issues Harmonized technical requirements for manufacturers to follow for Market Authorization Application (MAA).

National Regulatory Authority

(a) Health Authority (HA): The Health Authority to prepare drug regulatory guidelines and guidance documents which are compliant and conformity to existing laws and regulations and also coordinate with Global and/or regional regulatory body and in consultation with Pharmaceutical Manufacturer's Association issues technical requirements and process for Marketing Authorization Approval.

(b) Pharmaceutical Industry: Manufacturer develops drugs according to regulatory necessity of quality, safety and efficacy and applies for Marketing Authorization.

Syllabus Topic: Role Of Regulatory Affairs Department

RA acts as the interface between the pharmaceutical industry and Drug Regulatory authorities across the world. This department mainly involved in the registration of the drug products in respective countries prior to their marketing.

• The Regulatory Affairs department is the first point of contact between the Ministry of Health/Government departments and the company.

• The pharmaceutical business is being regulated by Drug Regulatory Affairs through designing appropriate laws (rules) and enforcing the same to attain and brought up highest standard of quality into the Global Trade.

• To bring a new drug into the market, it takes many years and therefore it is very crucial that the process should be managed effectively from the starting of the process to the end, so that drugs can meet the regulatory requirements and allow a favourable evaluation of quality, efficacy and safety to meet the shortest possible timeline.

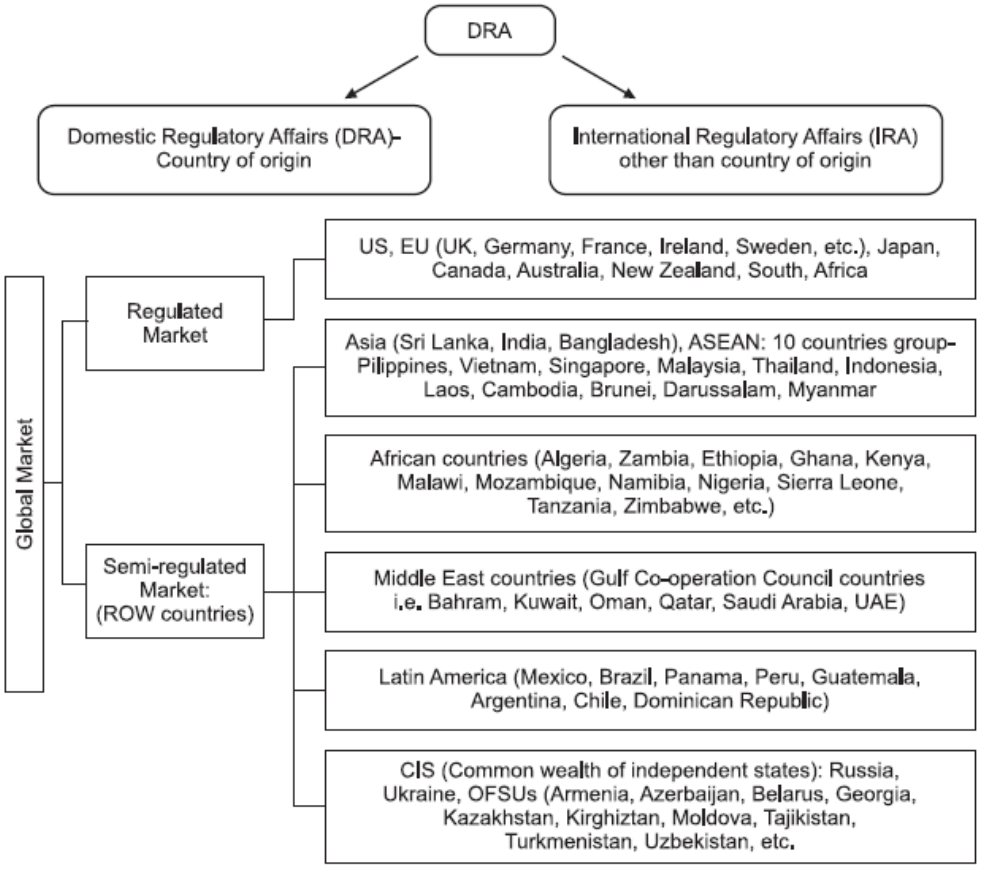


FIGURE: 3

DRA professional plays the crucial role in each phase of drug development and post marketing activities.

• The pharmaceutical companies (DRA professionals of the company) accumulate all the date pertains to drug discovery and development stages and uses the same for the purpose of registration and marketing of drug.

• RA professionals of the company have to abide the array of strict and guidelines throughout the drug development process, to ensure the drug and efficacy of drugs in the humans.

• The Regulatory Affairs department also takes part in the drug development, marketing concepts and is a crucial requirement to approve the packaging and advertising of drug/product before it is used commercially.

Syllabus Topic: Responsibility Of Regulatory Affairs Professionals

• The responsibility of RA is to ensure that their companies are complying with all of the system policy and laws pertaining to their business.

• Working with federal, state, and local regulatory agencies and staff on specific issues distressing their commerce i.e. working with Government agencies.

• RA advice their companies on the various aspects of regulatory affairs and particularly the climate that would affect proposed actions. (i.e. describing the "regulatory climate" in the region of issues such as the endorsement of prescription drugs).

• The Regulatory Affairs professional's job is to keep an eye on the ever-changing legislation in all the countries, particularly, where company have an interest to register their products.

• The RA professionals advice legally and technically at all stage both and help companies to save a lot of resources, time and money in drug development and its marketing.

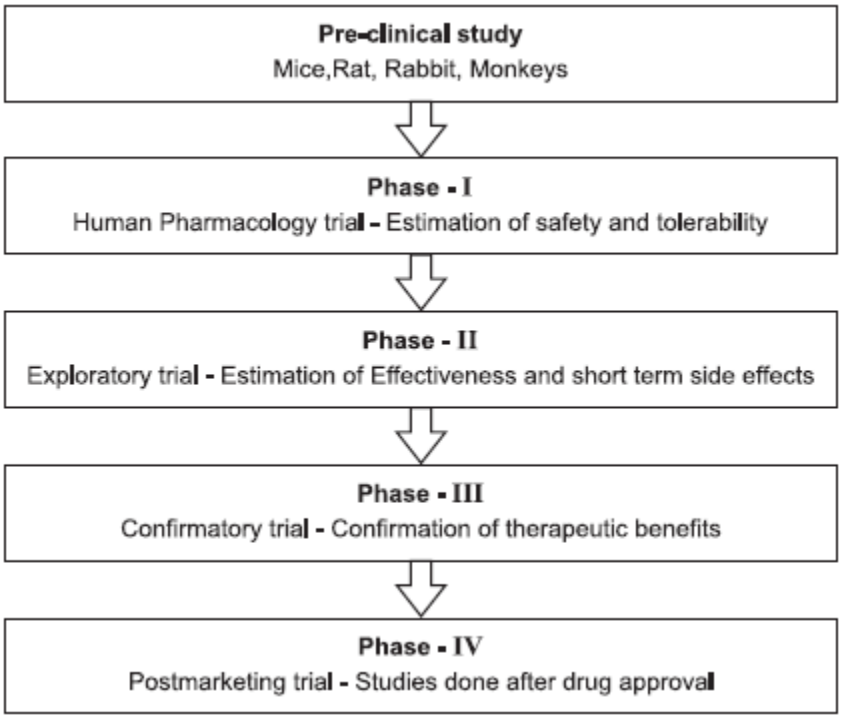
• In any organization, the main responsibilities of the RA involve the preparation and presentation of registration documents to regulatory agencies and follow up all the process and discussion to obtain and maintain marketing authorization (MA) for the concerned products.

Syllabus Topic: Regulatory Requirements For Drug Approval

Currently different nations have to follow different requirements for the regulatory approval of novice drug. It is almost difficult for every country to have the same regulatory approach for the Marketing Authorization Application (MAA), Therefore it is necessary to have knowledge about regulatory requirements for MAA of each country.

New Drug Application (NDA) is an application submitted to the respective regulatory authority for permission to market a new drug. To obtain this permission a sponsor submits preclinical and clinical test data for analyzing the drug information and description of manufacturing procedures.

After agency received the NDA, it undergoes a technical screening. This process of evaluation is made to ensure that the sufficient date and the required information have been submitted in each area justifying the "filling" application form.



Different phases of clinical trials

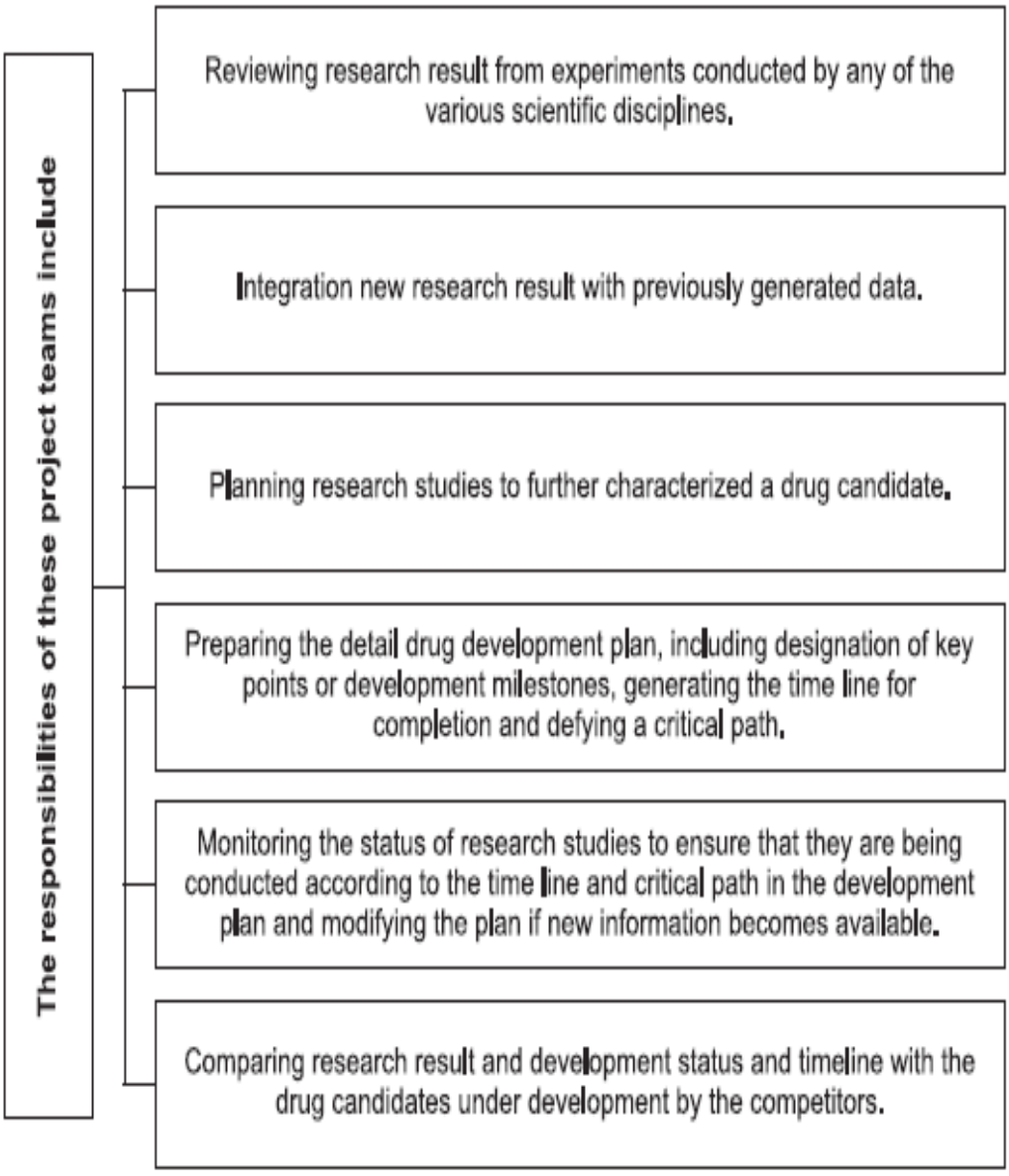
At the conclusion of the review of an NDA, there are 3 possible actions that can send to sponsor. If the action taken is either an approvable or a not approvable, then the regulator body provides applicant with an opportunity to meet with agency and discuss the deficiencies.	**NOT APPROVABLE** In this letter list of deficiencies and explain the reason.
	APPROVABLE It means that the drug can be approved, but minor deficiencies that can be corrected like-labeling changes and possible request commitment to do post-approval studies.
	APPROVAL It states that the drug is approved.

Possible action after the review of NDA

Syllabus Topic: Drug Development Teams

Drug development is the process of bringing a new pharmaceutical drug to the market once a lead compound has been identified through the process of drug discovery. It includes pre-clinical research on microorganisms and animals, filing for regulatory status, for an investigational new drug to initiate clinical trials on humans, and may

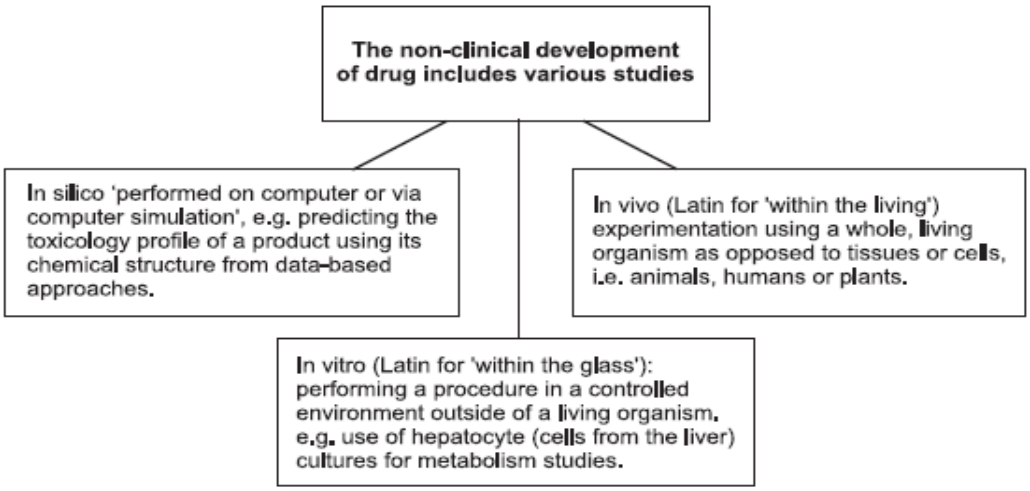
include the step of obtaining regulatory approval with a new drug application to market the drug.
The process of drug discovery and development is very long and needs 10-12 years which includes the close interaction of large number of scientific disciplines. Most biotechnology and pharmaceutical companies employ teams to mentor the process of various stages of drug development and making the drug candidate into therapeutic products.



The Responsibilities of these Project Teams

Syllabus Topic: Non-Clinical Drug Development

Pre-clinical trial: A laboratory test for a novel drug or a new medical device is usually done on animal subjects, to see if the hoped-for treatment really works and if it is safe to test on humans.



The primary aims of the non-clinical (or pre-clinical) development phase is to analyze and determine which candidate has the greatest probability of success, assess its safety, and raise firm scientific foundations before transition to the clinical development phase. This process of non-clinical development of medicine is very complex, time consuming and regulatory driven. The selected candidate compound should also meet non-medical objectives, which also include defining the IPR and making enough medicinal products available for clinical trials.

Once identification of candidate compound is completed, the non-clinical development should start answering the following questions, and answers will come from specific assessments/studies:

• Does it work? ® Assessment of Efficacy

• How will it be delivered and how will the body react? ® Profiling

• Is it safe? ® Toxicology/safety

• Is the manufacture viable and controllable?

Non-clinical development activities can continue throughout the life-cycle of the product.

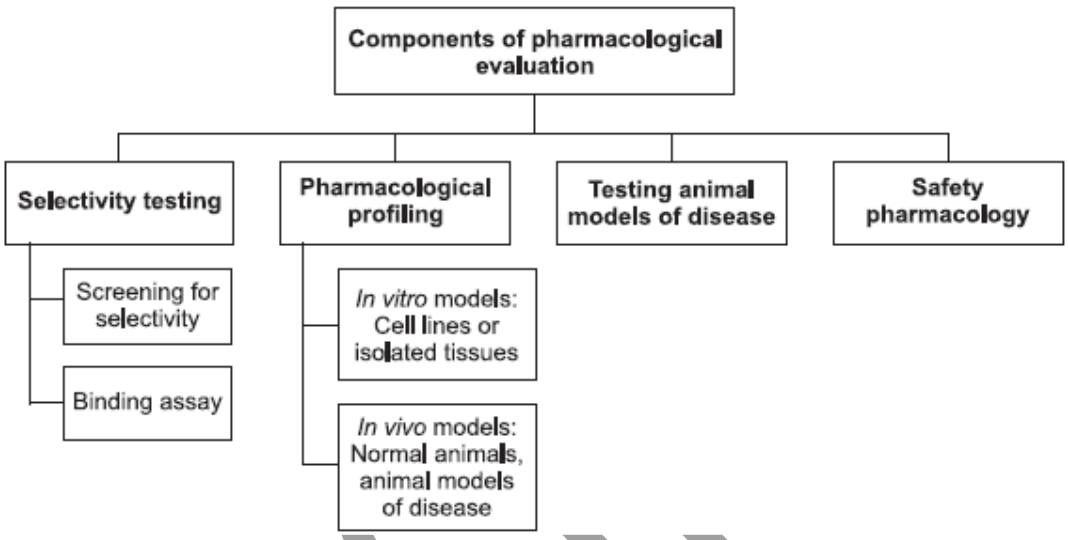
Syllabus Topic: Various Pharmacological Approaches To Drug Discovery

As an academic principle Pharmacology can be loosely defined as the study of effects of chemical substances on living systems. This definition is so broad that it holds all the

aspects of drug discovery, ranging from details of interaction between drug molecule and its target to consequences of placing the drug in the market.

Selectivity Testing: It consists of two main stages i.e. screening for selectivity and Binding assay. To determine the potency of drug, the selectivity of a compound for a chosen molecular target needs to be assessed.

Pharmacological Profiling: This includes the determination of pharmacodynamics effect of new compound, either on in-vitro models (which include cell lines or isolated tissues) or in-vivo models (which include normal animals, animal models of disease).



Component of pharmacological evaluation

The aim of pharmacological profiling is to answer the following questions:

• Do the molecular and cellular effects measured in screening assays actually give rise to the predicted pharmacological effects in intact tissues and whole animals?
• Does the compound produce effects in intact tissues or whole animals not associated with actions on its principle molecular target?
• Is there a correspondence between potency of the drug at molecular level, tissue level and the whole animal level?
• Does in-vivo duration of action match up with the pharmacokinetic properties of the drug?
• What happens if the drug is continuously or repeatedly given to an animal over a course of days or weeks?
• Does it loose its effectiveness or reveal effects not seen on acute administration and whether there is any rebound after effect when it is stopped.

Syllabus Topic: Safety Pharmacology

• This includes the scientific evaluation and study of potentially life threatening pharmacological effects of a potential drug which is unrelated to the desired therapeutic effect and therefore may present a hazard.
• These tests are conducted at doses not too much in excess of the intended clinical dose.

• Safety pharmacology seeks to identify unanticipated effects of new drugs on major organ function (i.e. secondary pharmacological effects).
• It is aimed at detecting possible undesirable or dangerous effects of exposure of the drug in therapeutic doses.
• The emphasis is on acute effects produced by single-dose administration rather than effects on chronic exposure as in toxicological studies.

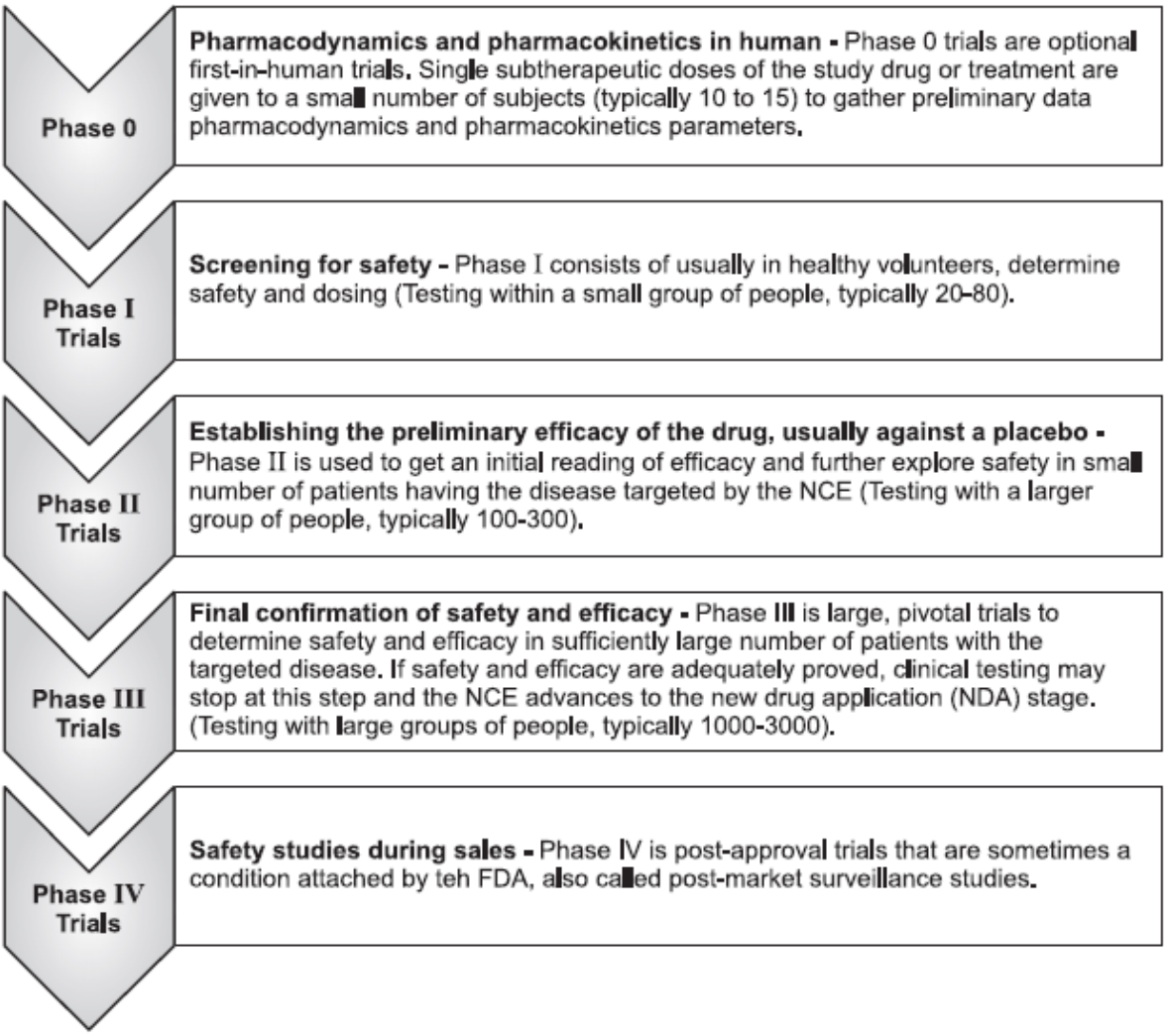
Syllabus Topic: Toxicological Approaches to Drug Discovery

Toxicity:

• Acute toxicity studies should be carried out in at least two species, usually mice and rats using the same route as intended for humans.
• In addition, at least two more routes should be used to ensure systemic absorption of the drug; this route may depend on the nature of the drug. Mortality should be looked for up to 72 hours after parenteral administration and up to 7 days after oral administration.
• The symptoms, signs and mode of death should be reported, with appropriate macroscopic and microscopic findings where necessary.

Long-Term Toxicity:

• These studies should be carried out in at least two mammalian species and out of these two mammalian species one should be a non-rodent.
• The duration of study will depend on the factor that whether the application is for marketing permission or for clinical trial, and in the later case, on the phases of trials.
• If a species is known to metabolize the drug in the same way as humans, it should be preferred in long-term toxicity studies. The drug should be administered 7 days a week by the route intended for clinical use in humans.
• A control group of animals, given the vehicle alone, should always be included, and three other groups should be given graded doses of the drug; the highest dose should produce observable toxicity, the lowest dose should not cause observable toxicity, but should be comparable to the intended therapeutic dose in humans or a multiple of it.



Clinical Phases in New Drug Development

Syllabus Topic: Investigational New Drug (IND) Application

Investigational New Drug (IND) is a program by which any pharmaceutical company can approach to obtain permission for the initiation of human clinical trials and to ship an experimental drug across state lines (usually to clinical investigators) before a marketing application for the drug has been approved.

An investigational new drug (IND) application is to provide the data showing that it is reasonable to begin tests of a new drug on humans.

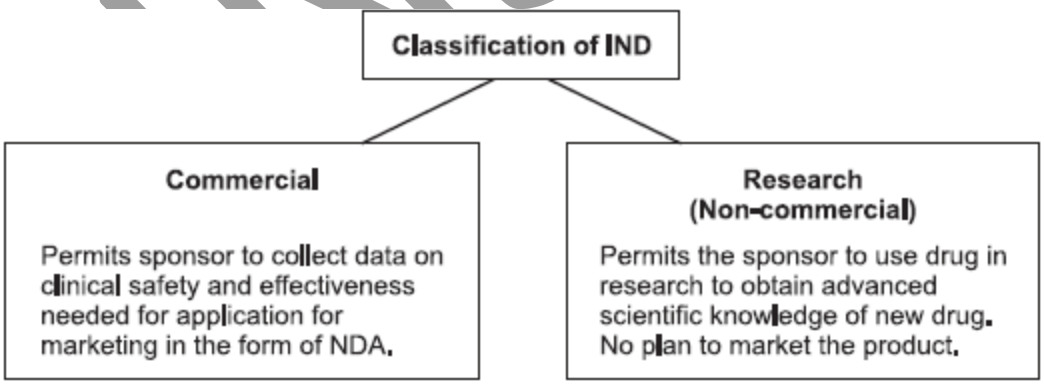
The IND application is also the vehicle through which a sponsor advances to the next stage of drug development known as clinical trials.

Current Federal law requires that a drug be the subject of an approved marketing application before it is transported or distributed across state lines (Clinical Investigators). Because a sponsor will probably want to ship the investigational drug to clinical investigators in many states, it must seek an exemption from that legal requirement. The IND application is the means through which the sponsor technically obtains this exemption from the FDA.

During a new drug's early preclinical development, the sponsor's primary goal is to determine if the product is reasonably safe for initial use in humans and if the compound exhibits pharmacological activity that justifies commercial development. When a product is identified as a viable candidate for further development, the sponsor then focuses on collecting the data and information necessary to establish that the product will not expose humans to unreasonable risks when used in limited, early-stage clinical studies.

FDA's role in the development of a new drug begins when the drug's sponsor (usually the manufacturer or potential marketer), having screened the new molecule for pharmacological activity and acute toxicity potential in animals, wants to test its diagnostic or therapeutic potential in humans.

At that point, the molecule changes in legal status under the Federal Food, Drug, and Cosmetic Act and becomes a new drug subject to specific requirements of the drug regulatory system.



IND Classification

Syllabus Topic: Types of IND Applications

Investigator IND application

• Emergency Use IND application

• Treatment IND application
• Screening IND application

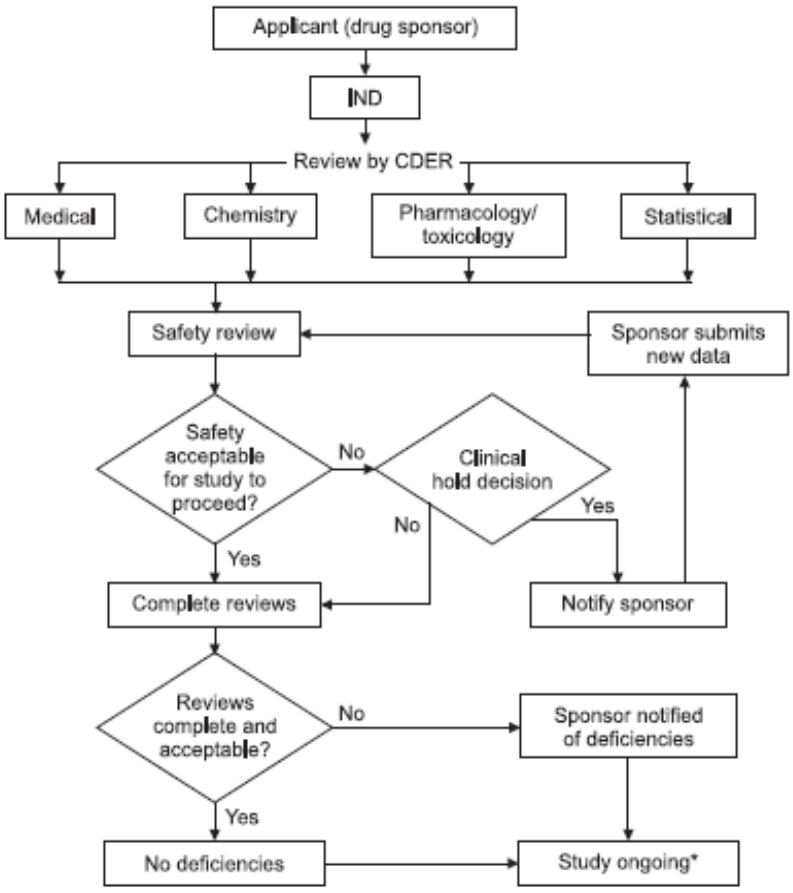
1. Investigator IND Application:
In this an application is submitted by a physician, who both initiates and conducts an investigation, and under whose immediate direction the investigational drug is administered or dispensed. A physician might submit a research IND application to propose studying of:
• An unapproved drug,
• An approved product for a new indication or
• An approved product in a new patient population.

2. Emergency Use IND Application:
This application allows the FDA to authorize use of an experimental drug in an emergency situation that does not allow time for submission of an IND application, in accordance with 21CFR, Sec. 312.23 or Sec. 312.20. It is also used for patients who do not meet the criteria of an existing study protocol, or if an approved study protocol does not exist. In such a case, FDA may authorize shipment of the drug for a specified use in advance of submission of an IND application.

3. Treatment IND Application:
• This application is submitted for experimental drugs showing promise in clinical testing for serious or immediately life-threatening conditions while the final clinical work is conducted and the FDA review takes place.
• A drug that is not approved for marketing may be under clinical investigation for a serious or immediately life-threatening disease condition in patients for whom no comparable or satisfactory alternative drug or other therapy is available.
• In the case of a serious disease, a drug ordinarily may be made available for treatment use during phase III investigations or after all clinical trials have been completed.
• In the case of an immediately life-threatening disease, a drug may be made available for treatment use earlier than phase III, but ordinarily not earlier than phase II.

4. Screening IND Application:
It is filed for multiple, closely related com pounds in order to screen for the preferred compounds or formulations. The preferred compound can be developed under a separate IND. It can also be used for screening different salts, esters and other drug derivatives that are chemically different, but pharmacodynamically similar.

IND Review and Report: During this time, FDA has an opportunity to review the IND application for safety to assure that research subjects will not be subjected to unreasonable risk. The report evaluates on the various factors like Medical Review, Chemistry Review, Pharmacology/Toxicology review, Statistical analysis and Safety review.



Layout chart for IND Application

Syllabus Topic: Investigator's Brochure (IB)

The Investigator's Brochure (IB) is a compilation of the clinical and non-clinical data on the investigational product(s) that are relevant to the study of the product(s) in human subject.

Purpose of Investigator's Brochure (IB)

Its purpose is to provide information to the investigators and others involved in the trial such as the dose, dose frequency/interval, methods of administration and safety monitoring procedures.

Contents of Investigator's Brochure

1. Table of contents.

2. Summary not exceeding 2 pages, highlighting the significant physical, chemical, pharmaceutical, pharmacological, toxicological, pharmacokinetic, metabolic, and clinical information available of IP.

3. Introduction: Chemical name, active ingredients, pharmacological class, anticipated – therapeutic/diagnostic indication(s). General approach to be followed in evaluating the IP.

4. Description of I.P.: Physical, chemical and pharmaceutical properties of I.P. Storage and handling of I.P. Any structural similarity with the other known compound given.

5. Non-clinical studies: The results of all relevant non-clinical pharmacology, toxicology, pharmacokinetic, and investigational product metabolism studies should be provided in summary form. The information provided may include: Species tested, Number of sex in each group, Unit dose (e.g., milligram/kilogram (mg/kg), Dose interval, Route of administration and Duration of dosing.

5.1 Non-clinical Pharmacology: A summary of the pharmacological aspects of the investigational product studied in animals should be included.

5.2 Pharmacokinetics and Product Metabolism in Animals: A summary of the pharmacokinetics (ADME) and biological transformation and disposition (getting a drug into its appropriate position in the body and in an appropriate concentration) of the investigational product in all species studied should be given.

5.3 Toxicology: (The study of the adverse effects of chemicals on animals): A summary of the toxicological effects found in relevant studies conducted in different animal species. (Single dose, Repeated dose, Carcinogenicity, Special studies (irritancy, sensitization), Reproductive toxicity).

6. Effects in Humans: A thorough discussion of the known effects of the investigational product(s) in humans should be provided, including information on pharmacokinetics, metabolism, Pharmacodynamics, dose response, safety, efficacy, and other pharmacological activities. (a) Pharmacokinetics and Product Metabolism in Humans.

7. Summary of Data and Guidance for the Investigator: This section should contain non-clinical and clinical data of IP. IB provides the investigator a clear understanding of the possible risks, adverse reactions, observations and precautions needed for the clinical trial.

Syllabus Topic: New Drug Application (NDA)

The vehicle through which drug sponsors formally propose that the regulatory body approves a new pharmaceutical for sale and marketing, and the data gathered during the animal studies and human clinical trials of an investigational new product becomes a part of the NDA.

Aim of NDA

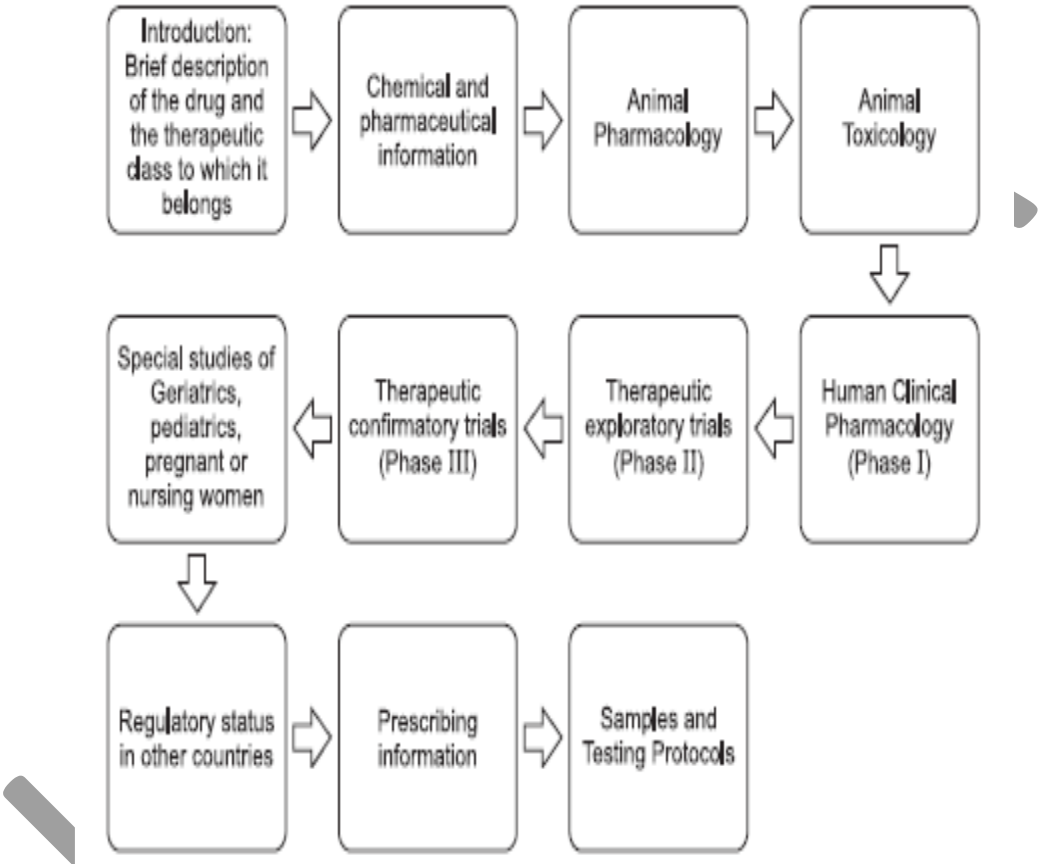
The aims of NDA include providing adequate information to permit FDA reviewers to establish the following:

• Safety and effectiveness of drug,

• Benefits overweigh risks,

• Is the drug's proposed labeling (package insert) appropriate, and what should it contain?

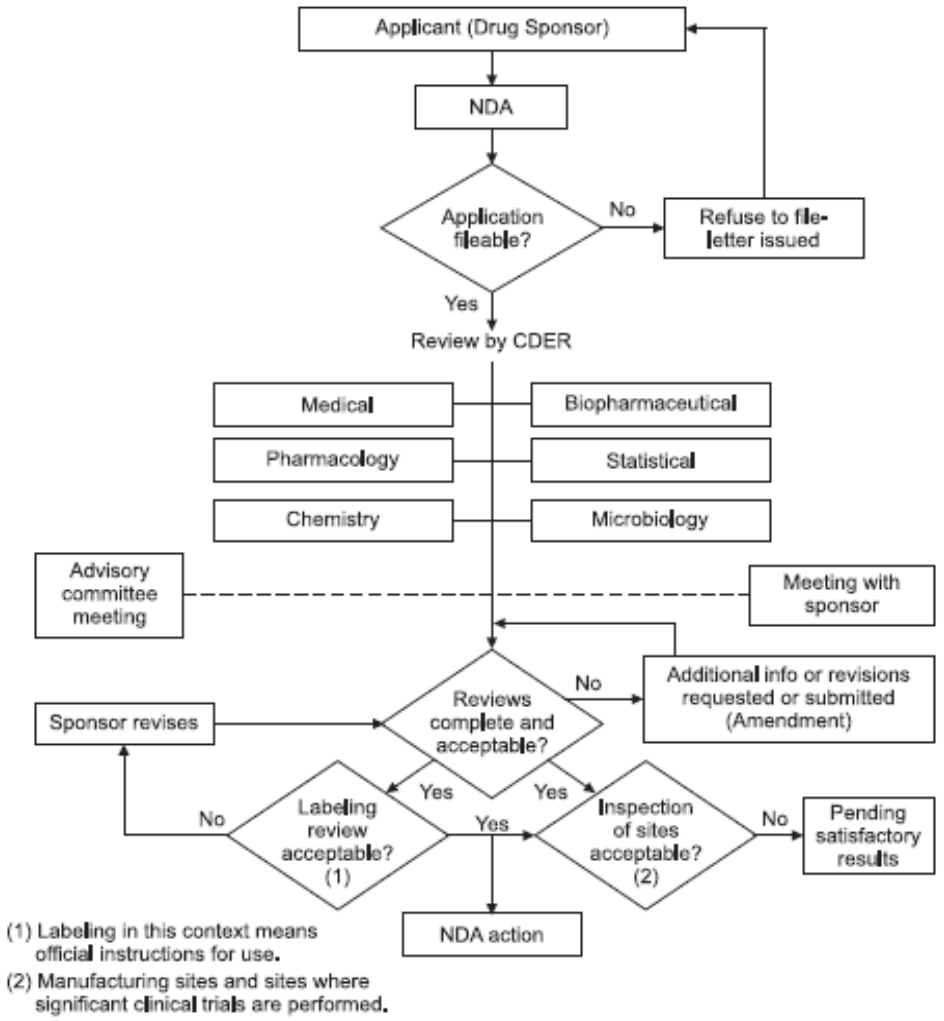
• Are the methods used in manufacturing (Good Manufacturing Practice, GMP) the drug and the controls used to maintain the drug's quality adequate to preserve the drug's identity, strength, quality, and purity? Risk Benefit.



NDA Contents

NDA Review Process

Once the application is submitted, the FDA has 60 days to conduct a preliminary review which will assess whether the NDA is "sufficiently complete to permit a substantive review". If everything is found to be acceptable, the FDA will decide if the NDA will get a standard or accelerated review and communicate the acceptance of the application and their review choice in another communication known as the 74-day letter.



NDA Review Process

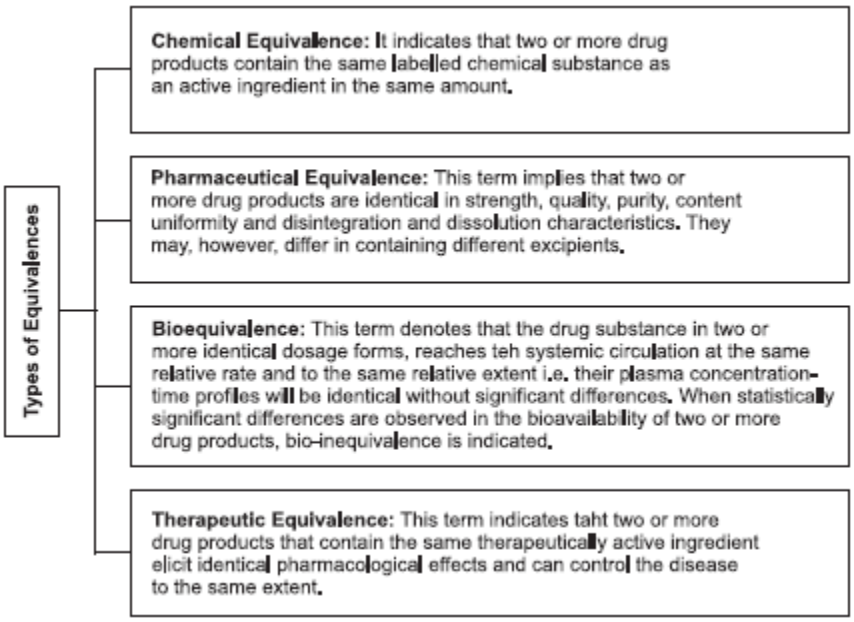
Syllabus Topic: Bio Equivalence Studies

BE studies are very essential to ensure uniformity in standards of quality, efficacy and safety of pharmaceutical products so that reasonable assurance can be provide for the various products containing same active ingredient, marketed by different licensees are clinically equivalent and interchangeable. Both Bioavailability and Bioequivalence focus on release of drug substance from its dosage form and subsequent absorption in circulation.

Similar approaches to measure bioavailability should be followed in demonstrating bioequivalence.

Bioavailability: Bioavailability means the rate and extent to which the active ingredient or active moiety is absorbed from a drug product and becomes available at the site of action.

Equivalence: It is a relative term that compares drug products with respect to a specific characteristic or function or to a defined set of standards.



Types of Equivalences

Syllabus Topic: Clinical Research Protocols

• It is a complete written description of and scientific rationale for a research activity involving human subjects.

• Sufficient information is to be gathered on the quality of the non-clinical safety to conduct the protocol and health authority/ethics committee approval is granted in the country where approval of the drug or device is sought.

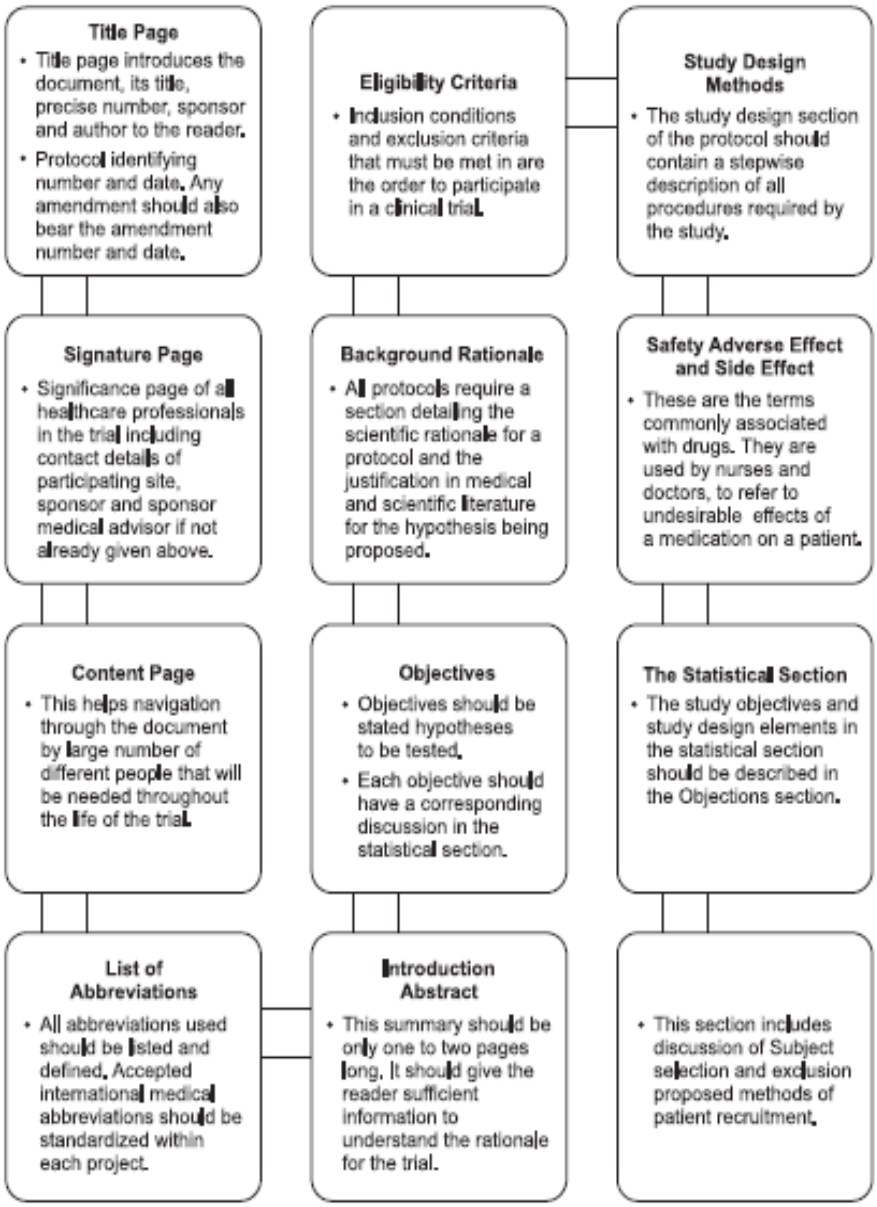
• The clinical trial design and objectives are written into a document called a clinical trial protocol. It is a document that states the background, objectives, rationale, design, methodology (including the methods for dealing with AEs, withdrawals etc.) and statistical considerations of the study. It also states the conditions under which the study shall be performed and managed.

• Look for better ways to prevent disease in people who never had the disease or to prevent a disease from returning.
• The protocols means:
- To clarify the research question.
- To compile existing knowledge.
- To formulate a hypothesis and objectives.
- To decide about a study design.
- To clarify ethical considerations.
- To apply for funding.
- To have a guideline and tool for the research team.

Parts of the Protocol:

1. Title Page.
2. Signature Page.
3. Content Page.
4. List of Abbreviations.

5. Introduction/Abstract.
6. Objectives.
7. Background/Rationale.
8. Eligibility Criteria.
9. Study Design/Methods (Including Drug/Device Info).
10. Safety/Adverse Events.
11. Regulatory Guidance.
12. Statistical Section (Including Analysis and Monitoring).
13. Human Subjects Protection/Informed Consent.



Syllabus Topic: Data Presentation for FDA Submissions

Study data standards describe a standard way to exchange clinical and non-clinical study data. These standards provide a consistent general framework for organizing study data, including templates for datasets, standard names for variables; identify appropriate controlled terminology and standard ways of doing calculations with common variables. Data standards also help FDA receive, process, review, and archive submissions more efficiently and effectively.

• FDA has been working towards a standardized approach to capture, receive and analyze study data.

• Standardization of study data is vital to integrate pre-marketing study data and post-marketing safety data to improve public health and patient safety.

• Central to this vision is the creation of an enterprise data infrastructure (Janus) within FDA to improve the management of all structured scientific data.

Data Standards: Data standards can be divided into two categories:

1. Exchange Standards: Exchange standards provide a consistent way to exchange information. Exchange standards help to ensure that the sending and the receiving systems both understand unambiguously what information is being exchanged.

2. Terminology Standards: Terminology standards provide a consistent way to describe concepts. For example, the Unique Ingredient Identifiers (UNII), developed by the FDA, provides a consistent way to describe substances in foods and drugs.

Vocabulary developed National Institute of Cancer describes terminology related to cancer.

Syllabus Topic: Management of Clinical Studies

Clinical trial management is most simply defined as the process that an organization follows to ensure that quality (defined as minimized risks and clean data) is delivered efficiently and punctually. It refers to a standards-driven process that a project manager initiates and follows in order to successfully manage clinical trial sites, clinical research associates, and workflow by using clinical trial management tools or software prolonged timelines and heavy costs related to large trials have been prompted a new focus on more efficient clinical trial management. It is possible to dramatically reduce the total cost of a clinical trial by 60% - 90% without compromising the scientific validity of the results.

Life Cycle of Clinical Trial Project:

A more accurate control, regardless of the therapeutic area or trial stages (all the way through from 'preclinical' phase 1 to 'post approval' phase 4 studies), is ensured by typically breaking down the life cycle of each clinical trial project into 4 phases: Conceptual, Planning, Implementation and Analysis.

Clinical Trial Protocol: A protocol is a document that describes the purpose, design, methodology, statistical considerations and organization of a study, and provides basic information and rationale for the clinical study. The contents that should be present in the protocol are described by the GCP. The protocol writing is a task for one person, usually the principal investigator, not a committee.

There are various challenges of Project management in clinical trials. Clinical trials all need the same coordinated processes and systems, irrespective of the size, scope, costs, or period. The key challenge is then to implement and maintain effective management systems and techniques in response to the needs of the trial project.

THANK YOU