INTERNATIONAL CONFERENCE ON HARMONISATION OF
TECHNICAL REQUIREMENTS FOR REGISTRATION OF PHARMACEUTICALS
FOR HUMAN USE

ICH Harmonised Tripartite Guideline

CLINICAL SAFETY DATA MANAGEMENT: DEFINITIONS AND STANDARDS FOR EXPEDITED REPORTING

Recommended for Adoption
at Step 4 of the ICH Process
on 27 October 1994
by the ICH Steering Committee

This Guideline has been developed by the appropriate ICH Expert Working Group and has been subject to consultation by the regulatory parties, in accordance with the ICH Process. At Step 4 of the Process the final draft is recommended for adoption to the regulatory bodies of the European Union, Japan and USA.

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I. INTRODUCTION

It is important to harmonize the way to gather and, if necessary, to take action on important clinical safety information arising during clinical development. Thus, agreed definitions and terminology, as well as procedures, will ensure uniform Good Clinical Practice standards in this area. The initiatives already undertaken for marketed medicines through the CIOMS-1 and CIOMS-2 Working Groups on expedited (alert) reports and periodic safety update reporting, respectively, are important precedents and models. However, there are special circumstances involving medicinal products under development, especially in the early stages and before any marketing experience is available. Conversely, it must be recognized that a medicinal product will be under various stages of development and/or marketing in different countries, and safety data from marketing experience will ordinarily be of interest to regulators in countries where the medicinal product is still under investigational-only (Phase 1, 2, or 3) status. For this reason, it is both practical and well-advised to regard pre-marketing and post-marketing clinical safety reporting concepts and practices as interdependent, while recognizing that responsibility for clinical safety within regulatory bodies and companies may reside with different departments, depending on the status of the product (investigational vs. marketed).

There are two issues within the broad subject of clinical safety data management that are appropriate for harmonization at this time:

(1) the development of standard definitions and terminology for key aspects of clinical safety reporting, and

(2) the appropriate mechanism for handling expedited (rapid) reporting, in the investigational (i.e. pre-approval) phase.

The provisions of this guideline should be used in conjunction with other ICH Good Clinical Practice guidelines.

II. DEFINITIONS AND TERMINOLOGY ASSOCIATED WITH CLINICAL SAFETY EXPERIENCE

A. Basic Terms

Definitions for the terms adverse event (or experience), adverse reaction, and unexpected adverse reaction have previously been agreed to by consensus of the more than 30 Collaborating Centres of the WHO International Drug Monitoring Centre

(Uppsala, Sweden). [Edwards, I.R., et al, Harmonization in Pharmacovigilance. *Drug Safety* 10(2): 93-102, 1994.] Although those definitions can pertain to situations involving clinical investigations, some minor modifications are necessary, especially to accommodate the pre-approval, development environment.

The following definitions, with input from the WHO Collaborative Centre, have been agreed:

1. ADVERSE EVENT (OR ADVERSE EXPERIENCE)

Any untoward medical occurrence in a patient or clinical investigation subject administered a pharmaceutical product and which does not necessarily have to have a causal relationship with this treatment.

An adverse event (AE) can therefore be any unfavourable and unintended sign (including an abnormal laboratory finding, for example), symptom, or disease temporally associated with the use of a medicinal product, whether or not considered related to the medicinal product.

2. ADVERSE DRUG REACTION (ADR)

In the *pre-approval clinical experience* with a new medicinal product or its new usages, particularly as the therapeutic dose(s) may not be established:

all noxious and unintended responses to a medicinal product related to any dose should be considered adverse drug reactions.

The phrase "responses to a medicinal products" means that a causal relationship between a medicinal product and an adverse event is at least a reasonable possibility, i.e. the relationship cannot be ruled out.

Regarding *marketed medicinal products*, a well-accepted definition of an adverse drug reaction in the post-marketing setting is found in WHO Technical Report 498 [1972] and reads as follows:

A response to a drug which is noxious and unintended and which occurs at doses normally used in man for prophylaxis, diagnosis, or therapy of disease or for modification of physiological function.

The old term "side effect" has been used in various ways in the past, usually to describe negative (unfavourable) effects, but also positive (favourable) effects. It is recommended that this term no longer be used and particularly should not be regarded as synonymous with adverse event or adverse reaction.

3. UNEXPECTED ADVERSE DRUG REACTION

An adverse reaction, the nature or severity of which is not consistent with the applicable product information (e.g. Investigator's Brochure for an unapproved investigational medicinal product). (See section III.C.)

B. Serious Adverse Event or Adverse Drug Reaction

During clinical investigations, adverse events may occur which, if suspected to be medicinal product-related (adverse drug reactions), might be significant enough to

lead to important changes in the way the medicinal product is developed (e.g. change in dose, population, needed monitoring, consent forms). This is particularly true for reactions which, in their most severe forms, threaten life or function. Such reactions should be reported promptly to regulators.

Therefore, special medical or administrative criteria are needed to define reactions that, either due to their nature ("serious") or due to the significant, unexpected information they provide, justify expedited reporting.

To ensure no confusion or misunderstanding of the difference between the terms "serious" and "severe", which are not synonymous, the following note of clarification is provided:

The term "severe" is often used to describe the intensity (severity) of a specific event (as in mild, moderate, or severe myocardial infarction); the event itself, however, may be of relatively minor medical significance (such as severe headache). This is not the same as "serious", which is based on patient/event outcome or action criteria usually associated with events that pose a threat to a patient's life or functioning. Seriousness (not severity) serves as a guide for defining regulatory reporting obligations.

After reviewing the various regulatory and other definitions in use or under discussion elsewhere, the following definition is believed to encompass the spirit and meaning of them all:

A serious adverse event (experience) or reaction is any untoward medical occurrence that at any dose:

- *results in death,*
- *is life-threatening,*

NOTE: The term "life-threatening" in the definition of "serious" refers to an event in which the patient was at risk of death at the time of the event; it does not refer to an event which hypothetically might have caused death if it were more severe.

- *requires inpatient hospitalisation or prolongation of existing hospitalisation,*
- *results in persistent or significant disability/incapacity, or*
- *is a congenital anomaly/birth defect.*

Medical and scientific judgement should be exercised in deciding whether expedited reporting is appropriate in other situations, such as important medical events that may not be immediately life-threatening or result in death or hospitalization but may jeopardise the patient or may require intervention to prevent one of the other outcomes listed in the definition above. *These should also usually be considered serious.*

Examples of such events are intensive treatment in an emergency room or at home for allergic bronchospasm; blood dyscrasias or convulsions that do not result in hospitalization; or development of drug dependency or drug abuse.

C. Expectedness of an Adverse Drug Reaction

The purpose of expedited reporting is to make regulators, investigators, and other appropriate people aware of new, important information on serious reactions. Therefore, such reporting will generally involve events previously unobserved or undocumented, and a guideline is needed on how to define an event as "unexpected" or "expected" (expected/unexpected from the perspective of previously observed, not on the basis of what might be anticipated from the pharmacological properties of a medicinal product).

As stated in the definition (II.A.3.), an "unexpected" adverse reaction is one, the nature or severity of which is not consistent with information in the relevant source document(s). Until source documents are amended, expedited reporting is required for additional occurrences of the reaction.

The following documents or circumstances will be used to determine whether an adverse event/reaction is expected:

1. For a medicinal product not yet approved for marketing in a country, a company's Investigator's Brochure will serve as the source document in that country. (See section III.F. and ICH Guideline for the Investigator's Brochure.)
2. Reports which add significant information on specificity or severity of a known, already documented serious ADR constitute unexpected events. For example, an event more specific or more severe than described in the Investigator's Brochure would be considered "unexpected". Specific examples would be (a) acute renal failure as a labeled ADR with a subsequent new report of interstitial nephritis and (b) hepatitis with a first report of fulminant hepatitis.

III. STANDARDS FOR EXPEDITED REPORTING

A. What Should be Reported?

1. SINGLE CASES OF SERIOUS, UNEXPECTED ADRS

All adverse drug reactions (ADRs) that are both serious and unexpected are subject to expedited reporting. This applies to reports from spontaneous sources and from any type of clinical or epidemiological investigation, independent of design or purpose. It also applies to cases not reported directly to a sponsor or manufacturer (for example, those found in regulatory authority-generated ADR registries or in publications). The source of a report (investigation, spontaneous, other) should always be specified.

Expedited reporting of reactions which are serious but expected will ordinarily be inappropriate. Expedited reporting is also inappropriate for serious events from clinical investigations that are considered not related to study product, whether the event is expected or not. Similarly, non-serious adverse reactions, whether expected or not, will ordinarily not be subject to *expedited* reporting.

Information obtained by a sponsor or manufacturer on serious, unexpected reports from any source should be submitted on an expedited basis to appropriate regu-

latory authorities if the minimum criteria for expedited reporting can be met. See section III.B.

Causality assessment is required for clinical investigation cases. All cases judged by either the reporting health care professional or the sponsor as having a reasonable suspected causal relationship to the medicinal product qualify as ADRs. For purposes of reporting, adverse event reports associated with marketed drugs (spontaneous reports) usually imply causality.

Many terms and scales are in use to describe the degree of causality (attributability) between a medicinal product and an event, such as certainly, definitely, probably, possibly or likely related or not related. Phrases such as "plausible relationship", "suspected causality", or "causal relationship cannot be ruled out" are also invoked to describe cause and effect. However, there is currently no standard international nomenclature. The expression "reasonable causal relationship" is meant to convey in general that there are facts (evidence) or arguments to suggest a causal relationship.

2. OTHER OBSERVATIONS

There are situations in addition to single case reports of "serious" adverse events or reactions that may necessitate rapid communication to regulatory authorities; appropriate medical and scientific judgement should be applied for each situation. In general, information that might materially influence the benefit-risk assessment of a medicinal product or that would be sufficient to consider changes in medicinal product administration or in the overall conduct of a clinical investigation represents such situations. Examples include:

a. For an "expected", serious ADR, an increase in the rate of occurrence which is judged to be clinically important.

b. A significant hazard to the patient population, such as lack of efficacy with a medicinal product used in treating life-threatening disease.

c. A major safety finding from a newly completed animal study (such as carcinogenicity).

B. Reporting Time Frames

1. FATAL OR LIFE-THREATENING UNEXPECTED ADRs

Certain ADRs may be sufficiently alarming so as to require very rapid notification to regulators in countries where the medicinal product or indication, formulation, or population for the medicinal product are still not approved for marketing, because such reports may lead to consideration of suspension of, or other limitations to, a clinical investigations program. Fatal or life-threatening, unexpected ADRs occurring in *clinical investigations* qualify for very rapid reporting. Regulatory agencies should be notified (e.g. by telephone, facsimile transmission, or in writing) as soon as possible but no later than 7 calendar days after first knowledge by the sponsor that a case qualifies, followed by as complete a report as possible within 8 additional calendar days. This report must include an assessment of the importance and

implication of the findings, including relevant previous experience with the same or similar medicinal products.

2. ALL OTHER SERIOUS, UNEXPECTED ADRs

Serious, unexpected reactions (ADRs) that are not fatal or life-threatening must be filed as soon as possible but no later than 15 calendar days after first knowledge by the sponsor that the case meets the minimum criteria for expedited reporting.

3. MINIMUM CRITERIA FOR REPORTING

Information for final description and evaluation of a case report may not be available within the required time frames for reporting outlined above. Nevertheless, for regulatory purposes, initial reports should be submitted within the prescribed time as long as the following minimum criteria are met: an identifiable patient; a suspect medicinal product; an identifiable reporting source; and an event or outcome that can be identified as serious and unexpected, and for which, in clinical investigation cases, there is a reasonable suspected causal relationship. Follow-up information should be actively sought and submitted as it becomes available.

C. How to Report

The CIOMS-I form has been a widely accepted standard for expedited adverse event reporting. However, no matter what the form or format used, it is important that certain basic information/data elements, when available, be included with any expedited report, whether in a tabular or narrative presentation. The listing in Attachment 1 addresses those data elements regarded as desirable; if all are not available at the time of expedited reporting, efforts should be made to obtain them. (See section III.B.)

All reports must be sent to those regulators or other official parties requiring them (as appropriate for the local situation) in countries where the drug is under development.

D. Managing Blinded Therapy Cases

When the sponsor and investigator are blinded to individual patient treatment (as in a double-blind study), the occurrence of a serious event requires a decision on whether to open (break) the code for the specific patient. If the investigator breaks the blind, then it is assumed the sponsor will also know the assigned treatment for that patient. Although it is advantageous to retain the blind for all patients prior to final study analysis, when a serious adverse reaction is judged reportable on an expedited basis, it is recommended that the blind be broken only for that specific patient by the sponsor even if the investigator has not broken the blind. It is also recommended that, when possible and appropriate, the blind be maintained for those persons, such as biometrics personnel, responsible for analysis and interpretation of results at the study's conclusion.

There are several disadvantages to maintaining the blind under the circumstances described which outweigh the advantages. By retaining the blind, placebo and comparator (usually a marketed product) cases are filed unnecessarily. When the blind is eventually opened, which may be many weeks or months after reporting to regulators, it must be ensured that company and regulatory data bases are revised. If the event is serious, new, and possibly related to the medicinal product, then if the Investigator's Brochure is updated, notifying relevant parties of the new information in a blinded fashion is inappropriate and possibly misleading. Moreover, breaking the blind for a single patient usually has little or no significant implications for the conduct of the clinical investigation or on the analysis of the final clinical investigation data.

However, when a fatal or other "serious" outcome is the primary efficacy endpoint in a clinical investigation, the integrity of the clinical investigation may be compromised if the blind is broken. Under these and similar circumstances, it may be appropriate to reach agreement with regulatory authorities in advance concerning serious events that would be treated as disease-related and not subject to routine expedited reporting.

E. Miscellaneous Issues

1. REACTIONS ASSOCIATED WITH ACTIVE COMPARATOR OR PLACEBO TREATMENT

It is the sponsor's responsibility to decide whether active comparator drug reactions should be reported to the other manufacturer and/or directly to appropriate regulatory agencies. Sponsors must report such events to either the manufacturer of the active control or to appropriate regulatory agencies. Events associated with placebo will usually not satisfy the criteria for an ADR and, therefore, for expedited reporting.

2. PRODUCTS WITH MORE THAN ONE PRESENTATION OR USE

To avoid ambiguities and uncertainties, an ADR that qualifies for expedited reporting with one presentation of a product (e.g. a dosage form, formulation, delivery system) or product use (e.g. for an indication or population), should be reported or referenced to regulatory filings across other product presentations and uses.

It is not uncommon that more than one dosage form, formulation, or delivery system (oral, IM, IV, topical, etc.) of the pharmacologically active compound(s) is under study or marketed; for these different presentations there may be some marked differences in the clinical safety profile. The same may apply for a given product used in different indications or populations (single dose vs. chronic administration, for example). Thus, "expectedness" may be product or product-use specific, and separate Investigator's Brochures may be used accordingly. However, such documents are expected to cover ADR information that applies to all affected product presentations and uses. When relevant, separate discussions of pertinent product-specific or use-specific safety information will also be included.

It is recommended that any adverse drug reactions that qualify for expedited reporting observed with one product dosage form or use be cross referenced to regu-

latory records for all other dosage forms and uses for that product. This may result in a certain amount of overreporting or unnecessary reporting in obvious situations (for example, a report of phlebitis on IV injection sent to authorities in a country where only an oral dosage form is studied or marketed). However, underreporting is completely avoided.

3. POST-STUDY EVENTS

Although such information is not routinely sought or collected by the sponsor, serious adverse events that occurred after the patient had completed a clinical study (including any protocol-required post-treatment follow-up) will possibly be reported by an investigator to the sponsor. Such cases should be regarded for expedited reporting purposes as though they were study reports. Therefore, a causality assessment and determination of expectedness are needed for a decision on whether or not expedited reporting is required.

F. Informing Investigators and Ethics Committees / Institutional Review Boards of New Safety Information

International standards regarding such communication are discussed within the ICH GCP Guidelines, including the addendum on "Guideline for the Investigator's Brochure". In general, the sponsor of a study should amend the Investigator's Brochure as needed, and in accord with any local regulatory requirements, so as to keep the description of safety information updated.

Attachment 1

KEY DATA ELEMENTS FOR INCLUSION IN EXPEDITED REPORTS OF SERIOUS ADVERSE DRUG REACTIONS

The following list of items has its foundation in several established precedents, including those of CIOMS-I, the WHO International Drug Monitoring Centre, and various regulatory authority forms and guidelines. Some items may not be relevant depending on the circumstances. The minimum information required for expedited reporting purposes is: an identifiable patient, the name of a suspect medicinal product, an identifiable reporting source, and an event or outcome that can be identified as serious and unexpected and for which, in clinical investigation cases, there is a reasonable suspected causal relationship. Attempts should be made to obtain follow-up information on as many other listed items pertinent to the case.

1. Patient Details

- Initials
- Other relevant identifier (clinical investigation number, for example)
- Gender
- Age and/or date of birth

- Weight
- Height

2. Suspected Medicinal Product(s)

- Brand name as reported
- International Non-Proprietary Name (INN)
- Batch number
- Indication(s) for which suspect medicinal product was prescribed or tested
- Dosage form and strength
- Daily dose and regimen (specify units – e.g., mg, ml, mg/kg)
- Route of administration
- Starting date and time of day
- Stopping date and time, or duration of treatment

3. Other Treatment(s)

For concomitant medicinal products (including non-prescription/OTC medicinal products) and non-medicinal product therapies, provide the same information as for the suspected product.

4. Details of Suspected Adverse Drug Reaction(s)

Full description of reaction(s) including body site and severity, as well as the criterion (or criteria) for regarding the report as serious should be given. In addition to a description of the reported signs and symptoms, whenever possible, attempts should be made to establish a specific diagnosis for the reaction.

- Start date (and time) of onset of reaction
- Stop date (and time) or duration of reaction
- Dechallenge and rechallenge information
- Setting (e.g. hospital, out-patient clinic, home, nursing home)

Outcome: information on recovery and any sequelae; what specific tests and/or treatment may have been required and their results; for a fatal outcome, cause of death and a comment on its possible relationship to the suspected reaction should be provided. Any autopsy or other post-mortem findings (including a coroner's report) should also be provided when available. Other information: anything relevant to facilitate assessment of the case, such as medical history including allergy, drug or alcohol abuse; family history; findings from special investigations.

5. Details on Reporter of Event (Suspected ADR)

- Name
- Address
- Telephone number
- Profession (speciality)

6. Administrative and Sponsor/Company Details

Source of report: was it spontaneous, from a clinical investigation (provide details), from the literature (provide copy), other?

- Date event report was first received by sponsor/manufacturer
- Country in which event occurred
- Type of report filed to authorities: initial or follow-up (first, second, etc.)
- Name and address of sponsor/manufacturer/company
- Name, address, telephone number, and FAX number of contact person in reporting company or institution
- Identifying regulatory code or number for marketing authorization dossier or clinical investigation process for the suspected product (for example IND or CTX number, NDA number)
- Sponsor/manufacturer's identification number for the case (this number must be the same for the initial and follow-up reports on the same case).

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INTRODUCTION TO THE GUIDELINE

The objective of this guideline is to allow the compilation of a single-core clinical study report acceptable to all regulatory authorities of the ICH regions. The regulatory authority specific additions will consist of modules to be considered as appendices, available upon request according to regional regulatory requirements.

The clinical study report described in this guideline is an "integrated" full report of an individual study of any therapeutic, prophylactic or diagnostic agent (referred to herein as drug or treatment) conducted in patients, in which the clinical and statistical description, presentations, and analyses are integrated into a single report, incorporating tables and figures into the main text of the report, or at the end of the text, and with appendices containing the protocol, sample case report forms, investigator related information, information related to the test drugs/investigational products including active control/comparators, technical statistical documentation, related publications, patient data listings, and technical statistical details such as derivations, computations, analyses, and computer output etc. The integrated full report of a study should not be derived by simply joining a separate clinical and statistical report. Although this guideline is mainly aimed at efficacy and safety trials, the basic principles and structure described can be applied to other kinds of trials, such as clinical pharmacology studies. Depending on the nature and importance of such studies, a less detailed report might be appropriate.

The guideline is intended to assist sponsors in the development of a report that is complete, free from ambiguity, well organized and easy to review. The report should provide a clear explanation of how the critical design features of the study were chosen and enough information on the plan, methods and conduct of the study so that there is no ambiguity in how the study was carried out. The report with its appendices should also provide enough individual patient data, including the demographic and baseline data, and details of analytical methods, to allow replication of the critical analyses when authorities wish to do so. It is also particularly important that all analyses, tables, and figures carry, in text or as part of the table, clear identification of the set of patients from which they were generated.

Depending on the regulatory authority's review policy, abbreviated reports using summarized data or with some sections deleted, may be acceptable for uncontrolled studies or other studies not designed to establish efficacy (but a controlled safety study should be reported in full), for seriously flawed or aborted studies, or for controlled studies that examine conditions clearly unrelated to those for which a claim is made. However, a full description of safety aspects should be included in these cases. If an abbreviated report is submitted, there should be enough detail of design and results to allow the regulatory authority to determine whether a full report is needed. If there is any question regarding whether the reports are needed, it may be useful to consult the regulatory authority.

In presenting the detailed description of how the study was carried out, it may be possible simply to restate the description in the initial protocol. Often, however, it

is possible to present the methodology of the study more concisely in a separate document. In each section describing the design and conduct of the study, it is particularly important to clarify features of the study that are not well-described in the protocol and identify ways in which the study as conducted differed from the protocol, and to discuss the statistical methods and analyses used to account for these deviations from the planned protocol.

The full integrated report of the individual study should include the most detailed discussion of individual adverse events or laboratory abnormalities, but these should usually be reexamined as part of an overall safety analysis of all available data in any application.

The report should describe demographic and other potentially predictive characteristics of the study population and, where the study is large enough to permit this, present data for demographic (e.g. age, sex, race, weight) and other (e.g. renal or hepatic function) subgroups so that possible differences in efficacy or safety can be identified. Usually, however, subgroup responses should be examined in the larger database used in the overall analysis.

The data listings requested as part of the report (usually in an appendix) are those needed to support critical analyses. Data listings that are part of the report should be readily usable by the reviewer. Thus, although it may be desirable to include many variables in a single listing to limit size, this should not be at the expense of clarity. An excess of data should not be allowed to lead to overuse of symbols instead of words or easily understood abbreviations or to too small displays etc. In this case, it is preferable to produce several listings.

Data should be presented in the report at different levels of detail: overall summary figures and tables for important demographic, efficacy and safety variables may be placed in the text to illustrate important points; other summary figures, tables and listings for demographic, efficacy and safety variables should be provided in section 14; individual patient data for specified groups of patients should be provided as listings in Appendix 16.2; and all individual patient data (archival listings requested only in the US) should be provided in Appendix 16.4.

In any table, figure or data listing, estimated or derived values, if used, should be identified in a conspicuous fashion. Detailed explanations should be provided as to how such values were estimated or derived and what underlying assumptions were made.

The guidance provided below is detailed and is intended to notify the applicant of virtually all of the information that should routinely be provided so that post-submission requests for further data clarification and analyses can be reduced as much as possible. Nonetheless, specific requirements for data presentation and/or analysis may depend on specific situations, may evolve over time, may vary from drug class to drug class, may differ among regions and cannot be described in general terms; it is therefore important to refer to specific clinical guidelines and to discuss data presentation and analyses with the reviewing authority, whenever possible. Detailed written guidance on statistical approaches is available from some authorities.

Each report should consider all of the topics described (unless clearly not relevant) although the specific sequence and grouping of topics may be changed if alternatives are more logical for a particular study. Some data in the appendices are specific requirements of individual regulatory authorities and should be submitted as appropriate. The numbering should then be adapted accordingly.

In the case of very large trials, some of the provisions of this guideline may be impractical or inappropriate. When planning and when reporting such trials, contact with regulatory authorities to discuss an appropriate report format is encouraged.

The provisions of this guideline should be used in conjunction with other ICH guidelines.

STRUCTURE AND CONTENT OF CLINICAL STUDY REPORTS

1. TITLE PAGE

The title page should contain the following information:

- study title
- name of test drug/investigation product
- indication studied
- if not apparent from the title, a brief (1 to 2 sentences) description giving design (parallel, cross-over, blinding, randomized) comparison (placebo, active, dose/response), duration, dose, and patient population
- name of the sponsor
- protocol identification (code or number)
- development phase of study
- study initiation date (first patient enrolled, or any other verifiable definition)
- date of early study termination, if any
- study completion date (last patient completed)
- name and affiliation of principal or coordinating investigator(s) or sponsor's responsible medical officer
- name of company/sponsor signatory (the person responsible for the study report within the company/sponsor. The name, telephone number and fax number of the company/sponsor contact persons for questions arising during review of the study report should be indicated on this page or in the letter of application.)
- statement indicating whether the study was performed in compliance with Good Clinical Practices (GCP), including the archiving of essential documents
- date of the report (identify any earlier reports from the same study by title and date).

2. SYNOPSIS

A brief synopsis (usually limited to 3 pages) that summarizes the study should be provided (see Annex I of the guideline for an example of a synopsis format used in Europe). The synopsis should include numerical data to illustrate results, not just text or p-values.

3. TABLE OF CONTENTS FOR THE INDIVIDUAL CLINICAL STUDY REPORT

The table of contents should include:

– the page number or other locating information of each section, including summary tables, figures and graphs,

– a list and the locations of appendices, tabulations and any case report forms provided.

4. LIST OF ABBREVIATIONS AND DEFINITION OF TERMS

A list of the abbreviations, and lists and definitions of specialized or unusual terms or measurements units used in the report should be provided. Abbreviated terms should be spelled out and the abbreviation indicated in parentheses at first appearance in the text.

5. ETHICS

5.1 Independent Ethics Committee (IEC) or Institutional Review Board (IRB)

It should be confirmed that the study and any amendments were reviewed by an Independent Ethics Committee or Institutional Review Board. A list of all IECs or IRBs consulted should be given in appendix 16.1.3 and, if required by the regulatory authority, the name of the committee Chair should be provided.

5.2 Ethical Conduct of the Study

It should be confirmed that the study was conducted in accordance with the ethical principles that have their origins in the Declaration of Helsinki.

5.3 Patient Information and Consent

How and when informed consent was obtained in relation to patient enrolment (e.g. at allocation, pre-screening) should be described.

Representative written information for the patient (if any) and a sample patient consent form should be provided in appendix 16.1.3.

6. INVESTIGATORS AND STUDY ADMINISTRATIVE STRUCTURE

The administrative structure of the study (e.g. principal investigator, coordinating investigator, steering committee, administration, monitoring and evaluation committees, institutions, statistician, central laboratory facilities, contract research organisation (C.R.O.), clinical trial supply management) should be described briefly in the body of the report.

There should be provided in appendix 16.1.4 a list of the investigators with their affiliations, their role in the study and their qualifications (curriculum vitae or equivalent). A similar list for other persons whose participation materially affected the conduct of the study should also be provided in appendix 16.1.4. In the case of large trials with many investigators the above requirements may be abbreviated

to consist of general statements of qualifications for persons carrying out particular roles in the study with only the name, degree and institutional affiliation and roles of each investigator or other participant.

The listing should include:

a) Investigators

b) Any other person carrying out observations of primary or other major efficacy variables, such as a nurse, physician's assistant, clinical psychologist, clinical pharmacist, or house staff physician. It is not necessary to include in this list a person with only an occasional role, e.g. an on-call physician who dealt with a possible adverse effect or a temporary substitute for any of the above

c) The author(s) of the report, including the responsible biostatistician(s).

Where signatures of the principal or coordinating investigators are required by regulatory authorities, these should be included in appendix 16.1.5 (see Annex II for a sample form). Where these are not required, the signature of the sponsor's responsible medical officer should be provided in appendix 16.1.5.

7. INTRODUCTION

The introduction should contain a brief statement (maximum: 1 page) placing the study in the context of the development of the test drug/investigational product, relating the critical features of the study (e.g. rationale and aims, target population, treatment, duration, primary endpoints) to that development. Any guidelines that were followed in the development of the protocol or any other agreements/meetings between the sponsor/company and regulatory authorities that are relevant to the particular study, should be identified or described.

8. STUDY OBJECTIVES

A statement describing the overall purpose(s) of the study should be provided.

9. INVESTIGATIONAL PLAN

9.1 Overall Study Design and Plan – Description

The overall study plan and design (configuration) of the study (e.g. parallel, cross-over) should be described briefly but clearly, using charts and diagrams as needed. If other studies used a very similar protocol, it may be useful to note this and describe any important differences. The actual protocol and any changes should be included as appendix 16.1.1 and a sample case report form (unique pages only; i.e. it is not necessary to include identical pages from forms for different evaluations or visits) as appendix 16.1.2. If any of the information in this section comes from sources other than the protocol, these should be identified.

The information provided should include:

– treatments studied (specific drugs, doses and procedures)

– patient population studied and the number of patients to be included

– level and method of blinding/masking (e.g. open, double-blind, single-blind, blinded evaluators and unblinded patients and/or investigators)
– kind of control(s) (e.g. placebo, no treatment, active drug, dose-response, historical) and study configuration (parallel, cross-over)
– method of assignment to treatment (randomization, stratification)
– sequence and duration of all study periods, including pre-randomization and post-treatment periods, therapy withdrawal periods and single- and double-blind treatment periods. When patients are randomized should be specified. It is usually helpful to display the design graphically with a flow chart which includes timing of assessments (see Annexes IIIa and IIIb for an example)
– any safety, data monitoring or special steering or evaluation committees
– any interim analyses.

9.2 Discussion of Study Design, including the Choice of Control Groups

The specific control chosen and the study design used should be discussed, as necessary. Examples of design issues meriting discussion follow.

Generally, the control (comparison) groups that are recognized are placebo concurrent control, no treatment concurrent control, active treatment concurrent control, dose comparison concurrent control, and historical control. In addition to the type of control, other critical design features that may need discussion are use of a cross-over design and selection of patients with particular prior history, such as response or non-response to a specific drug or member of a drug class. If randomization was not used, it is important to explain how other techniques, if any, guarded against systematic selection bias.

Known or potential problems associated with the study design or control group chosen, should be discussed in light of the specific disease and therapies being studied. For a cross-over design, for example, there should be consideration, among other things, of the likelihood of spontaneous change in the disease and of carry-over effects of treatment during the study.

If efficacy was to be demonstrated by showing equivalence, i.e. the absence of a specified degree of inferiority of the new treatment compared to an established treatment, problems associated with such study designs should be addressed. Specifically there should be provided a basis for considering the study capable of distinguishing active from inactive therapy. Support may be provided by an analysis of previous studies similar to the present study with respect to important design characteristics (patient selection, study endpoints, duration, dose of active control, concomitant therapy etc.) showing a consistent ability to demonstrate superiority of the active control to placebo. How to assess the ability of the present study to distinguish effective from ineffective therapy should also be discussed. For example, it may be possible to identify a treatment response (based on past studies) that would clearly distinguish between the treated population and an untreated group. Such a response could be the change of a measure from baseline or some other specified outcome like healing rate or survival rate. Attainment of such a response would support the expectation that the study could have distin-

guished the active drug from an inactive drug. There should also be a discussion of the degree of inferiority of the therapy (often referred to as the delta value) the study was intended to show was not exceeded.

The limitations of historical controls are well known (difficulty of assuring comparability of treated groups, inability to blind investigators to treatment, change in therapy/disease, difference due to placebo effect etc.) and deserve particular attention.

Other specific features of the design may also deserve discussion, including presence or absence of washout periods and the duration of the treatment period, especially for a chronic illness. The rationale for dose and dose-interval selection should be explained, if it is not obvious. For example, once daily dosing with a short half-life drug whose effect is closely related in time to blood level is not usually effective; if the study design uses such dosing, this should be explained, e.g. by pointing to pharmacodynamic evidence that effect is prolonged compared to blood levels. The procedures used to seek evidence of "escape" from drug effect at the end of the dose-interval, such as measurements of effect just prior to dosing, should be described. Similarly, in a parallel design dose-response study, the choice of doses should be explained.

9.3 Selection of Study Population

9.3.1 INCLUSION CRITERIA

The patient population and the selection criteria used to enter the patients into the study should be described, and the suitability of the population for the purposes of the study discussed. Specific diagnostic criteria used, as well as specific disease requirements (e.g. disease of a particular severity or duration, results of a particular test or rating scale(s) or physical examination, particular features of clinical history, such as failure or success on prior therapy, or other potential prognostic factors and any age, sex or ethnic factors) should be presented.

Screening criteria and any additional criteria for randomization or entry into the test drug/investigational product treatment part of the trial should be described. If there is reason to believe that there were additional entry criteria, not defined in the protocol, the implications of these should be discussed. For example, some investigators may have excluded, or entered into other studies, patients who were particularly ill or who had particular baseline characteristics.

9.3.2 EXCLUSION CRITERIA

The criteria for exclusion at entry into the study should be specified and the rationale (e.g. safety concerns, administrative reasons or lack of suitability for the trial) provided. The impact of exclusions on the generalizability of the study should be discussed in section 13 of the study report, or in an overview of safety and efficacy.

9.3.3 REMOVAL OF PATIENTS FROM THERAPY OR ASSESSMENT

The predetermined reasons for removing patients from therapy or assessment observation, if any, should be described, as should the nature and duration of any planned follow-up observations in those patients.

9.4 Treatments

9.4.1 TREATMENTS ADMINISTERED

The precise treatments or diagnostic agents to be administered in each arm of the study, and for each period of the study, should be described including route and mode of administration, dose and dosage schedule.

9.4.2 IDENTITY OF INVESTIGATIONAL PRODUCT(S)

In the text of the report, a brief description of the test drug(s)/investigational product(s) (formulation, strength, batch number(s)) should be given. If more than one batch of test drug/investigational product was used, patients receiving each batch should be identified in appendix 16.1.6.

The source of placebos and active control/comparator product(s) should be provided. Any modification of comparator product(s) from their usual commercial state should be noted, and the steps taken to assure that their bioavailability was unaltered should be described.

For long-duration trials of investigational products with limited shelf-lives or incomplete stability data, the logistics of resupply of the materials should be described. Any use of test materials past their expiry date should be noted, and patients receiving them identified. If there were specific storage requirements, these should also be described.

9.4.3 METHOD OF ASSIGNING PATIENTS TO TREATMENT GROUPS

The specific methods used to assign patients to treatment groups, e.g. centralized allocation, allocation within sites, adaptive allocation (that is, assignment on the basis of earlier assignment or outcome) should be described in the text of the report, including any stratification or blocking procedures. Any unusual features should be explained.

A detailed description of the randomization method, including how it was executed, should be given in appendix 16.1.7 with references cited if necessary. A table exhibiting the randomization codes, patient identifier, and treatment assigned should also be presented in the appendix. For a multicentre study, the information should be given by centre. The method of generating random numbers should be explained.

For a historically controlled trial, it is important to explain how the particular control was selected and what other historical experiences were examined, if any, and how their results compared to the control used.

9.4.4 SELECTION OF DOSES IN THE STUDY

The doses or dose ranges used in the study should be given for all treatments and the basis for choosing them described (e.g. prior experience in humans, animal data).

9.4.5 SELECTION AND TIMING OF DOSE FOR EACH PATIENT

Procedures for selecting each patient's dose of test drug/investigational product and active control/comparator should be described. These procedures can vary from simple random assignment to a selected fixed drug/dose regimen, to some specified titration procedure, to more elaborate response-determined selection procedures, e.g. where dose is titrated upward at intervals until intolerance or some specified endpoint is achieved. Procedures for back-titration, if any, should also be described.

The timing (time of day, interval) of dosing and the relation of dosing to meals should be described, and if it was not specified, this should be noted.

Any specific instructions to patients about when or how to take the dose(s) should be described.

9.4.6 BLINDING

A description of the specific procedures used to carry out blinding should be provided (e.g. how bottles were labelled, labels that reveal blind-breakage, sealed code list/envelopes, double dummy techniques), including the circumstances in which the blind would be broken for an individual or for all patients, e.g. for serious adverse events, the procedures used and who had access to patient codes. If the study allowed for some investigators to remain unblinded (e.g. to allow them to adjust medication), the means of shielding other investigators should be explained. Measures taken to ensure that test drug/investigational product and placebo were indistinguishable and evidence that they were indistinguishable, should be described, as should the appearance, shape, smell, and taste of the test material. Measures to prevent unblinding by laboratory measurements, if used, should be described. If there was a data monitoring committee with access to unblinded data, procedures to ensure maintenance of overall study blinding should be described. The procedure to maintain the blinding when interim analyses are performed should also be explained.

If blinding was considered unnecessary to reduce bias for some or all of the observations, this should be explained; e.g. use of a random-zero sphygmomanometer eliminates possible observer bias in reading blood pressure and Holter tapes are often read by automated systems that are presumably immune to observer bias. If blinding was considered desirable but not feasible, the reasons and implications should be discussed. Sometimes blinding is attempted but is known to be imperfect because of obvious drug effects in at least some patients (dry mouth, bradycardia, fever, injection site reactions, changes in laboratory data). Such problems or potential problems should be identified and if there were any attempts to assess the magnitude of the problem or manage it (e.g. by having some endpoint measurements carried out by people shielded from information that might reveal treatment assignment), they should be described.

9.4.7 PRIOR AND CONCOMITANT THERAPY

Which drugs or procedures were allowed before and during the study, whether and how their use was recorded, and any other specific rules and procedures related to

permitted or forbidden concomitant therapy should be described. How allowed concomitant therapy might affect the outcome due either to drug-drug interaction or to direct effects on the study endpoints should be discussed, and how the independent effects of concomitant and study therapies could be ascertained should be explained.

9.4.8 TREATMENT COMPLIANCE

The measures taken to ensure and document treatment compliance should be described, e.g. drug accountability, diary cards, blood, urine or other body fluid drug level measurements, or medication event monitoring.

9.5 Efficacy and Safety Variables

9.5.1 EFFICACY AND SAFETY MEASUREMENTS ASSESSED AND FLOW CHART

The specific efficacy and safety variables to be assessed and laboratory tests to be conducted, their schedule (days of study, time of day, relation to meals, and the timing of critical measures in relation to test drug administration, e.g. just prior to next dose, two hours after dose), the methods for measuring them, and the persons responsible for the measurements should be described. If there were changes in personnel carrying out critical measurements, these should be reported.

It is usually helpful to display graphically in a flow chart (see Annex III of the guideline) the frequency and timing of efficacy and safety measurements; visit numbers and times should be shown, or, alternatively, times alone can be used (visit numbers alone are more difficult to interpret). Any specific instructions (e.g. guidance or use of a diary) to the patients should also be noted.

Any definitions used to characterize outcome (e.g. criteria for determining occurrence of acute myocardial infarction, designation of the location of the infarction, characterization of a stroke as thrombotic or haemorrhagic, distinction between TIA and stroke, assignment of cause of death) should be explained in full. Any techniques used to standardize or compare results of laboratory tests or other clinical measurements (e.g. ECG, chest X-ray) should also be described. This is particularly important in multicentre studies.

If anyone other than the investigator was responsible for evaluation of clinical outcomes (e.g. the sponsor or an external committee to review X-rays or ECGs or to determine whether the patient had a stroke, acute infarction, or sudden death) the person or group should be identified. The procedures, including means of maintaining blindness, and centralizing readings and measurements, should be described fully.

The means of obtaining adverse event data should be described (volunteered, checklist, or, questioning), as should any specific rating scale(s) used and any specifically planned follow-up procedures for adverse events or any planned rechallenge procedure.

Any rating of adverse events by the investigator, sponsor or external group (e.g. rating by severity, or, likelihood of drug causation) should be described. The criteria for such ratings, if any, should be given and the parties responsible for the ratings

should be clearly identified. If efficacy or safety was to be assessed in terms of categorical ratings, numerical scores etc., the criteria used for point assignment (e.g. definitions of point scores) should be provided. For multicentre studies, indicate how methods were standardized.

9.5.2 APPROPRIATENESS OF MEASUREMENTS

If any of the efficacy or safety assessments was not standard, i.e. widely used and generally recognized as reliable, accurate, and relevant (able to discriminate between effective and ineffective agents), its reliability, accuracy and relevance should be documented. It may be helpful to describe alternatives considered but rejected.

If a surrogate endpoint (a laboratory measurement or physical measurement or sign that is not a direct measure of clinical benefit) was used as a study endpoint, this should be justified e.g. by reference to clinical data, publications, guidelines or previous actions by regulatory authorities.

9.5.3 PRIMARY EFFICACY VARIABLE(S)

The primary measurements and endpoints used to determine efficacy should be clearly specified. Although the critical efficacy measurements may seem obvious, when there are multiple variables, or when variables are measured repeatedly, the protocol should identify the primary ones, with an explanation of why they were chosen, or designate the pattern of significant findings or other method of combining information that would be interpreted as supporting efficacy. If the protocol did not identify the primary variables, the study report should explain how these critical variables were selected (e.g. by reference to publications, guidelines or previous actions by regulatory authorities) and when they were identified (i.e. before or after the study was completed and unblinded). If an efficacy threshold was defined in the protocol, this should be described.

9.5.4 DRUG CONCENTRATION MEASUREMENTS

Any drug concentrations to be measured, and the sample collection times and periods in relation to the timing of drug administration, should be described. Any relation of drug administration and sampling to ingestion of food, posture and the possible effects of concomitant medication/alcohol/caffeine/nicotine should also be addressed. The biological sample measured, the handling of samples and the method of measurement used should be described, referring to published and/or internal assay validation documentation for methodological details. Where other factors are believed important in assessing pharmacokinetics (e.g. soluble circulating receptors, renal or hepatic function), the timing and plans to measure these factors should also be specified.

9.6 Data Quality Assurance

The quality assurance and quality control systems implemented to assure the quality of the data should be described in brief. If none were used, this should be stated.

Documentation of inter-laboratory standardization methods and quality assurance procedures, if used, should be provided under appendix 16.1.10.

Any steps taken at the investigation site or centrally to ensure the use of standard terminology and the collection of accurate, consistent, complete, and reliable data, such as training sessions, monitoring of investigators by sponsor personnel, instruction manuals, data verification, cross-checking, use of a central laboratory for certain tests, centralized ECG reading, or data audits, should be described. It should be noted whether investigator meetings or other steps were taken to prepare investigators and standardize performance.

If the sponsor used an independent internal or external auditing procedure, it should be mentioned here and described in appendix 16.1.8; and audit certificates, if available, should be provided in the same appendix.

9.7 Statistical Methods Planned in the Protocol and Determination of Sample Size

9.7.1 STATISTICAL AND ANALYTICAL PLANS

The statistical analyses planned in the protocol and any changes made before outcome results were available should be described. In this section emphasis should be on which analyses, comparisons and statistical tests were planned, not on which ones were actually used. If critical measurements were made more than once, the particular measurements (e.g. average of several measurements over the entire study, values at particular times, values only from study completers, or last on-therapy value) planned as the basis for comparison of test drug/investigational product and control should be specified. Similarly, if more than one analytical approach is plausible, e.g. changes from baseline response, slope analysis, life table analysis, the planned approach should be identified. Also, whether the primary analysis is to include adjustment for covariates should be specified.

If there were any planned reasons for excluding from analysis patients for whom data are available, these should be described. If there were any subgroups whose results were to be examined separately, these should be identified. If categorical responses (global scales, severity scores, responses of a certain size) were to be used in analysing responses, they should be clearly defined.

Planned monitoring of the results of the study should be described. If there was a data monitoring committee, either within or outside the sponsor's control, its composition and operating procedures should be described and procedures to maintain study blinding should be given. The frequency and nature of any planned interim analysis, any specified circumstances in which the study would be terminated, and any statistical adjustments to be employed because of interim analyses should be described.

9.7.2 DETERMINATION OF SAMPLE SIZE

The planned sample size and the basis for it, such as statistical considerations or practical limitations, should be provided. Methods for sample size calculation should be given together with their derivations or source of reference. Estimates

used in the calculations should be given and explanations provided as to how they were obtained. For a study intended to show a difference between treatments, the difference the study is designed to detect should be specified. For a positive control study intended to show that a new therapy is at least as effective as the standard therapy, the sample size determination should specify the difference between treatments that would be considered unacceptably large and therefore the difference the study is designed to be able to exclude.

9.8 Changes in the Conduct of the Study or Planned Analyses

Any change in the conduct of the study or planned analyses (e.g. dropping a treatment group, changing the entry criteria or drug dosages, adjusting the sample size etc.) instituted after the start of the study should be described. The time(s) and reason(s) for the change(s), the procedure used to decide on the change(s), the person(s) or group(s) responsible for the change(s) and the nature and content of the data available (and to whom they were available) when the change was made should also be described, whether the change was documented as a formal protocol amendment or not (personnel changes need not be included). Any possible implications of the change(s) for the interpretation of the study should be discussed briefly in this section and more fully in other appropriate sections of the report. In every section of the report, a clear distinction between conditions (procedures) planned in the protocol and amendments or additions should be made. In general, changes in planned analyses made prior to breaking the blind have limited implications for study interpretation. It is therefore particularly critical that the timing of changes relative to blind breaking and availability of outcome results be well characterized.

10. STUDY PATIENTS

10.1 Disposition of Patients

There should be a clear accounting of all patients who entered the study, using figures or tables in the text of the report. The numbers of patients who were randomized, and who entered and completed each phase of the study (or each week/month of the study) should be provided, as well as the reasons for all post-randomization discontinuations, grouped by treatment and by major reason (lost to follow-up, adverse event, poor compliance etc.). It may also be relevant to provide the number of patients screened for inclusion and a breakdown of the reasons for excluding patients during screening, if this could help clarify the appropriate patient population for eventual drug use. A flow chart is often helpful (see Annexes IVa and IVb of the guideline for example). Whether patients are followed for the duration of the study, even if drug is discontinued, should be made clear.

In appendix 16.2.1, there should also be a listing of all patients discontinued from the study after enrolment, broken down by centre and treatment group, giving a patient identifier, the specific reason for discontinuation, the treatment (drug and dose), cumulative dose (where appropriate), and the duration of treatment before discontinuation. Whether or not the blind for the patient was broken at the time of

discontinuation should be noted. It may also be useful to include other information, such as critical demographic data (e.g. age, sex, race), concomitant medication, and the major response variable(s) at termination. See Annex V for an example of such a listing.

10.2 Protocol Deviations

All important deviations related to study inclusion or exclusion criteria, conduct of the trial, patient management or patient assessment should be described.

In the body of the text, protocol deviations should be appropriately summarized by centre and grouped into different categories, such as:

– those who entered the study even though they did not satisfy the entry criteria
– those who developed withdrawal criteria during the study but were not withdrawn
– those who received the wrong treatment or incorrect dose
– those who received an excluded concomitant treatment.

In appendix 16.2.2, individual patients with these protocol deviations should be listed, broken down by centre for multicentre studies.

11. EFFICACY EVALUATION

11.1 Data Sets Analysed

Exactly which patients were included in each efficacy analysis should be precisely defined, e.g. all patients receiving any test drugs/investigational products, all patients with any efficacy observation or with a certain minimum number of observations, only patients completing the trial, all patients with an observation during a particular time window, only patients with a specified degree of compliance etc. It should be clear, if not defined in the study protocol, when (relative to study unblinding), and how inclusion/exclusion criteria for the data sets analysed were developed. Generally, even if the applicant's proposed primary analysis is based on a reduced subset of the patients with data, there should also be for any trial intended to establish efficacy an additional analysis using all randomized (or otherwise entered) patients with any on-treatment data.

There should be a tabular listing of all patients, visits and observations excluded from the efficacy analysis provided in appendix 16.2.3 (see Annex VI of the guideline for an example). The reasons for exclusions should also be analysed for the whole treatment group over time (see Annex VII of the guideline for an example).

11.2 Demographic and Other Baseline Characteristics

Group data for the critical demographic and baseline characteristics of the patients, as well as other factors arising during the study that could affect response, should be presented in this section and comparability of the treatment groups for all relevant characteristics should be displayed by use of tables or graphs in section 14.1. The data for the patient sample included in the "all patients with data" analysis should be given first. This can then be followed by data on other groups used in

principal analyses, such as the "per-protocol" analysis or other analyses, e.g. groups defined by compliance, concomitant disease/therapy, or demographic/baseline characteristics. When such groups are used, data for the complementary excluded group should also be shown. In a multicentre study where appropriate, comparability should be assessed by centre, and centres should be compared.

A diagram showing the relationship between the entire sample and any other analysis groups should be provided.

The critical variables will depend on the specific nature of the disease and on the protocol but will usually include:

- demographic variables
  - age
  - sex
  - race
- disease factors
  - specific entry criteria (if not uniform), duration, stage and severity of disease and other clinical classifications and sub-groupings in common usage or of known prognostic significance
  - baseline values for critical clinical measurements carried out during the study or identified as important indicators of prognosis or response to therapy
  - concomitant illness at trial initiation, such as renal disease, diabetes, heart failure
  - relevant previous illness
  - relevant previous treatment for illness treated in the study
  - concomitant treatment maintained, even if the dose was changed during the study, including oral contraceptive and hormone replacement therapy; treatments stopped at entry into the study period (or changed at study initiation)
- other factors that might affect response to therapy (e.g. weight, renin status, antibody levels, metabolic status)
- other possibly relevant variables (e.g. smoking, alcohol intake, special diets) and, for women, menstrual status and date of last menstrual period, if pertinent for the study.

In addition to tables and graphs giving group data for these baseline variables, relevant individual patient demographic and baseline data, including laboratory values, and all concomitant medication for all individual patients randomized (broken down by treatment and by centre for multicentre studies) should be presented in by-patient tabular listings in appendix 16.2.4. Although some regulatory authorities will require all baseline data to be presented elsewhere in tabular listings, the appendix to the study report should be limited to only the most relevant data, generally the variables listed above.

11.3 Measurements of Treatment Compliance

Any measurements of compliance of individual patients with the treatment regimen under study and drug concentrations in body fluids should be summarized, analysed by treatment group and time interval, and tabulated in appendix 16.2.5.

11.4 Efficacy Results and Tabulations of Individual Patient Data

11.4.1 ANALYSIS OF EFFICACY

Treatment groups should be compared for all critical measures of efficacy (primary and secondary endpoints; any pharmacodynamic endpoints studied), as well as benefit/risk assessment(s) in each patient where these are utilized. In general, the results of all analyses contemplated in the protocol and an analysis including all patients with on-study data should be performed in studies intended to establish efficacy. The analysis should show the size (point estimate) of the difference between the treatments, the associated confidence interval and, where utilized, the results of hypothesis testing.

Analyses based on continuous variables (e.g. mean blood pressure or depression scale score) and categorical responses (e.g. cure of an infection) can be equally valid; ordinarily both should be presented if both were planned and are available. If categories are newly created (i.e. not in the statistical plan) the basis for them should be explained. Even if one variable receives primary attention (e.g. in a blood pressure study, supine blood pressure at week x), other reasonable measures (e.g. standing blood pressure and blood pressures at other particular times) should be assessed, at least briefly. In addition, the time course of response should be described, if possible. For a multicentre study, where appropriate, data display and analysis of individual centres should be included for critical variables to give a clear picture of the results at each site, especially the larger sites.

If any critical measurements or assessments of efficacy or safety outcomes were made by more than one party (e.g. both the investigator and an expert committee may offer an opinion on whether a patient had an acute infarction), overall differences between the ratings should be shown, and each patient having disparate assessments should be identified. The assessments used should be clear in all analyses.

In many cases, efficacy and safety endpoints are difficult to distinguish, (e.g. deaths in a fatal disease study). Many of the principles addressed below should be adopted for critical safety measures as well.

11.4.2 STATISTICAL/ANALYTICAL ISSUES

The statistical analysis used should be described for clinical and statistical reviewers in the text of the report, with detailed documentation of statistical methods (see section Annex IX) presented in appendix 16.1.9. Important features of the analysis including the particular methods used, adjustments made for demographic or baseline measurements or concomitant therapy, handling of drop-outs and missing data, adjustments for multiple comparisons, special analyses of multicentre studies, and adjustments for interim analyses, should be discussed. Any changes in the analysis made after blind-breaking should be identified.

In addition to the general discussion the following specific issues should be addressed (unless not applicable):

11.4.2.1 Adjustments for Covariates

Selection of, and adjustments for, demographic or baseline measurements, concomitant therapy, or any other covariate or prognostic factor should be explained in the report, and methods of adjustment, results of analyses, and supportive information (e.g. ANCOVA or Cox regression output) should be included in the detailed documentation of statistical methods. If the covariates or methods used in these analyses differed from those planned in the protocol, the differences should be explained and where possible and relevant, the results of planned analyses should also be presented. Although not part of the individual study report, comparisons of covariate adjustments and prognostic factors across individual studies may be an informative analysis in a summary of clinical efficacy data.

11.4.2.2 Handling of Dropouts or Missing Data

There are several factors that may affect dropout rates. These include the duration of the study, the nature of the disease, the efficacy and toxicity of the drug under study, and other factors that are not therapy related. Ignoring the patients who dropped out of the study and drawing conclusions based only on patients who completed the study can be misleading. A large number of dropouts, however, even if included in an analysis, may introduce bias, particularly if there are more early dropouts in one treatment group or the reasons for dropping out are treatment or outcome related. Although the effects of early dropouts, and sometimes even the direction of bias, can be difficult to determine, possible effects should be explored as fully as possible. It may be helpful to examine the observed cases at various time points or, if dropouts were very frequent, to concentrate on analyses at time points when most of the patients were still under observation and when the full effect of the drug was realized. It may also be helpful to examine modelling approaches to the evaluation of such incomplete data sets.

The results of a clinical trial should be assessed not only for the subset of patients who completed the study, but also for the entire patient population as randomized or at least for all those with any on-study measurements. Several factors need to be considered and compared for the treatment groups in analysing the effects of dropouts: the reasons for the dropouts, the time to dropout, and the proportion of dropouts among treatment groups at various time points.

Procedures for dealing with missing data, e.g. use of estimated or derived data, should be described. Detailed explanation should be provided as to how such estimations or derivations were done and what underlying assumptions were made.

11.4.2.3 Interim Analyses and Data Monitoring

The process of examining and analysing data accumulating in a clinical trial, either formally or informally, can introduce bias and/or increase type I error. Therefore, all interim analyses, formal or informal, pre-planned or ad hoc, by any study participant, sponsor staff member, or data monitoring group should be described in full, even if the treatment groups were not identified. The need for statistical adjustment because of such analyses should be addressed. Any operating instructions or procedures used for such analyses should be described. The minutes of meetings of

any data monitoring group and any data reports reviewed at those meetings, particularly a meeting that led to a change in the protocol or early termination of the study, may be helpful and should be provided in appendix 16.1.9. Data monitoring without code-breaking should also be described, even if this kind of monitoring is considered to cause no increase in type I error.

11.4.2.4 Multicentre Studies

A multicentre study is a single study under a common protocol, involving several centres (e.g. clinics, practices, hospitals) where the data collected are intended to be analysed as a whole (as opposed to a post-hoc decision to combine data or results from separate studies). Individual centre results should be presented, however, where appropriate, e.g. when the centres have sufficient numbers of patients to make such analysis potentially valuable, the possibility of qualitative or quantitative treatment-by-centre interaction should be explored. Any extreme or opposite results among centres should be noted and discussed, considering such possibilities as differences in study conduct, patient characteristics, or clinical settings. Treatment comparison should include analyses that allow for centre differences with respect to response. If appropriate, demographic, baseline, and post-baseline data, as well as efficacy data, should be presented by centre, even though the combined analysis is the primary one.

11.4.2.5 Multiple Comparison/Multiplicity

False positive findings increase in number as the number of significance tests (number of comparisons) performed increases. If there was more than one primary endpoint (outcome variable), more than one analysis of particular endpoint, or if there were multiple treatment groups, or subsets of the patient population being examined, the statistical analysis should reflect awareness of this and either explain the statistical adjustment used for type I error criteria or give reasons why it was considered unnecessary.

11.4.2.6 Use of an "Efficacy Subset" of Patients

Particular attention should be devoted to the effects of dropping patients with available data from analyses because of poor compliance, missed visits, ineligibility, or any other reason. As noted above, an analysis using all available data should be carried out for all studies intended to establish efficacy, even if it is not the analysis proposed as the primary analysis by the applicant. In general, it is advantageous to demonstrate robustness of the principal trial conclusions with respect to alternative choices of patient populations for analysis. Any substantial differences resulting from the choice of patient population for analysis should be the subject of explicit discussion.

11.4.2.7 Active-Control Studies Intended to Show Equivalence

If an active control study is intended to show equivalence (i.e. lack of a difference greater than a specified size) between the test drug/investigational product and the active control/comparator, the analysis should show the confidence interval for the comparison between the two agents for critical end points and the relation of

that interval to the prespecified degree of inferiority that would be considered unacceptable. (See 9.2, for important considerations when using the active control equivalence design.)

11.4.2.8 Examination of Subgroups

If the size of the study permits, important demographic or baseline value-defined subgroups should be examined for unusually large or small responses and the results presented, e.g. comparison of effects by age, sex, or race, by severity or prognostic groups, by history of prior treatment with a drug of the same class etc. If these analyses were not carried out because the study was too small it should be noted. These analyses are not intended to "salvage" an otherwise non-supportive study but may suggest hypotheses worth examining in other studies or be helpful in refining labelling information, patient selection, dose selection etc. Where there is a prior hypothesis of a differential effect in a particular subgroup, this hypothesis and its assessment should be part of the planned statistical analysis.

11.4.3 TABULATION OF INDIVIDUAL RESPONSE DATA

In addition to tables and graphs representing group data, individual response data and other relevant study information should be presented in tables. Some regulatory authorities may require all individual data in archival case report tabulations. What needs to be included in the report will vary from study to study and from one drug class to another and the applicant must decide, if possible after consultation with the regulatory authority, what to include in appendix to the study report. The study report should indicate what material is included as an appendix, what is in the more extensive archival case report tabulations, if required by the regulatory authority, and what is available on request.

For a controlled study in which critical efficacy measurements or assessments (e.g. blood or urine cultures, pulmonary function tests, angina frequency, or global evaluations) are repeated at intervals, the data listings accompanying the report should include, for each patient, a patient identifier, all measured or observed values of critical measurements, including baseline measurements, with notation of the time during the study (e.g. days on therapy and time of day, if relevant) when the measurements were made, the drug/dose at the time (if useful, given as mg/kg), any measurements of compliance, and any concomitant medications at the time of, or close to the time of, measurement or assessment. If, aside from repeated assessments, the study included some overall responder vs. non-responder evaluation(s) (bacteriologic cure or failure), it should also be included. In addition to critical measurements, the tabulation should note whether the patient was included in the efficacy evaluation (and which evaluation, if more than one), provide patient compliance information, if collected, and a reference to the location of the case report form, if included. Critical baseline information such as age, sex, weight, disease being treated (if more than one in study), and disease stage or severity, is also helpful. The baseline values for critical measurements would ordinarily be included as zero time values for each efficacy measurement.

The tabulation described should usually be included in appendix 16.2.6 of the study report, rather than in the more extensive case report tabulations required by some

regulatory authorities, because it represents the basic efficacy data supporting summary tables. Such a thorough tabulation can be unwieldy for review purposes, however, and it is expected that more targeted displays will be developed as well. For example, if there are many measurements reported, tabulations of the most critical measurements for each patient (e.g. the blood pressure value at certain visits might be more important than others) will be useful in providing an overview of each individual's results in a study, with each patient's response summarized on a single line or small number of lines.

11.4.4 DRUG DOSE, DRUG CONCENTRATION, AND RELATIONSHIPS TO RESPONSE

When the dose in each patient can vary, the actual doses received by patients should be shown and individual patient's doses should be tabulated. Although studies not designed as dose-response studies may have limited ability to contribute dose-response information, the available data should be examined for whatever information they can yield. In examining the dose response, it may be helpful to calculate dose as mg/kg body weight or mg/m^2 body surface.

Drug concentration information, if available, should also be tabulated (appendix 16.2.5), analysed in pharmacokinetic terms and, if possible, related to response.

Further guidance on the design and analysis of studies exploring dose-response or concentration response can be found in the ICH Guideline "Dose-Response Information to Support Drug Registration".

11.4.5 DRUG-DRUG AND DRUG-DISEASE INTERACTIONS

Any apparent relationship between response and concomitant therapy and between response and past and/or concurrent illness should be described.

11.4.6 BY-PATIENT DISPLAYS

While individual patient data ordinarily can be displayed in tabular listings, it has on occasion been helpful to construct individual patient profiles in other formats, such as graphic displays. These might, for example, show the value of (a) particular parameter(s) over time, the drug dose over the same period, and the times of particular events (e.g. an adverse event or change in concomitant therapy). Where group mean data represent the principal analyses, this kind of "case report extract" may offer little advantage; it may be helpful, however, if overall evaluation of individual responses is a critical part of the analysis.

11.4.7 EFFICACY CONCLUSIONS

The important conclusions concerning efficacy should be concisely described, considering primary and secondary endpoints, pre-specified and alternative statistical approaches and results of exploratory analyses.

12. SAFETY EVALUATION

Analysis of safety-related data can be considered at three levels. First, the extent of exposure (dose, duration, number of patients) should be examined to determine

the degree to which safety can be assessed from the study. Second, the more common adverse events, laboratory test changes etc. should be identified, classified in some reasonable way, compared for treatment groups, and analysed, as appropriate, for factors that may affect the frequency of adverse reactions/events, such as time dependence, relation to demographic characteristics, relation to dose or drug concentration etc. Finally, serious adverse events and other significant adverse events should be identified, usually by close examination of patients who left the study prematurely because of an adverse event, whether or not identified as drug related, or who died.

The ICH Guideline on Clinical Safety Data Management, Definitions and Standards for Expedited Reporting defines serious adverse events as follows: a "serious adverse event" (experience) or reaction is any untoward medical occurrence that at any dose: results in death, is life-threatening, requires inpatient hospitalization or prolongation of existing hospitalization, results in persistent or significant disability/incapacity, or is a congenital anomaly/birth defect.

For the purpose of this guideline, "other significant adverse events" are marked haematological and other laboratory abnormalities and any adverse events that led to an intervention, including withdrawal of drug treatment, dose reduction or significant additional concomitant therapy.

In the following sections, three kinds of analysis and display are called for:

1) summarized data, often using tables and graphical presentations presented in the main body of the report
2) listings of individual patient data, and
3) narrative statements of events of particular interest.

In all tabulations and analyses, events associated with both test drug and control treatment should be displayed.

12.1 Extent of Exposure

The extent of exposure to test drugs/investigational products (and to active control and placebo) should be characterized according to the number of patients exposed, the duration of exposure, and the dose to which they were exposed.

- *Duration:* Duration of exposure to any dose can be expressed as a median or mean, but it is also helpful to describe the number of patients exposed for specified periods of time, such as for one day or less, 2 days to one week, more than one week to one month, more than one month to 6 months etc. The numbers exposed to test drug(s)/investigational product(s) for the various durations should also be broken down into age, sex, and racial subgroups, and any other pertinent subgroups, such as disease (if more than one is represented), disease severity, concurrent illness.
- *Dose:* The mean or median dose used and the number of patients exposed to specified daily dose levels should be given; the daily dose levels used could be the maximum dose for each patient, the dose with longest exposure for each patient, or the mean daily dose. It is often useful to provide combined dose-duration information, such as the numbers exposed for a given duration (e.g. at least

one month) to the most common dose, the highest dose, the maximum recommended dose etc. In some cases, cumulative dose might be pertinent. Dosage may be given as the actual daily dose or on a mg/kg or mg/m^2 basis as appropriate. The numbers of patients exposed to various doses should be broken down into age, sex, and racial subgroups, and any other pertinent subgroups.

- *Drug concentration:* If available, drug concentration data (e.g. concentration at the time of an event, maximum plasma concentration, area under curve) may be helpful in individual patients for correlation with adverse events or changes in laboratory variables. (Appendix 16.2.5.)

  It is assumed that all patients entered into treatment who received at least one dose of the treatment are included in the safety analysis; if that is not so, an explanation should be provided.

12.2 Adverse Events (AEs)

12.2.1 BRIEF SUMMARY OF ADVERSE EVENTS

The overall adverse event experience in the study should be described in a brief narrative, supported by the following more detailed tabulations and analyses. In these tabulations and analyses, events associated with both the test drug and control treatment should be displayed.

12.2.2 DISPLAY OF ADVERSE EVENTS

All adverse events occurring after initiation of study treatments (including events likely to be related to the underlying disease or likely to represent concomitant illness, unless there is a prior agreement with the regulatory authority to consider specified events as disease related) should be displayed in summary tables (section 14.3.1). The tables should include changes in vital signs and any laboratory changes that were considered serious adverse events or other significant adverse events.

In most cases, it will also be useful to identify in such tables "treatment emergent signs and symptoms" (TESS; those not seen at baseline and those that worsened even if present at baseline).

The tables should list each adverse event, the number of patients in each treatment group in whom the event occurred, and the rate of occurrence. When treatments are cyclical, e.g. cancer chemotherapy, it may also be helpful to list results separately for each cycle. Adverse events should be grouped by body system. Each event may then be divided into defined severity categories (e.g. mild, moderate, severe) if these were used. The tables may also divide the adverse events into those considered at least possibly related to drug use and those considered not related, or use some other causality scheme (e.g. unrelated or possibly, probably, or definitely related). Even when such a causality assessment is used, the tables should include all adverse events, whether or not considered drug related, including events thought to represent intercurrent illnesses. Subsequent analyses of the study or of the overall safety data base may help to distinguish between adverse events that are, or are not, considered drug related. So that it is possible to analyse and eval-

uate the data in these tables, it is important to identify each patient having each adverse event. An example of such a tabular presentation is shown below.

Adverse Events: Number Observed and Rate, with Patient Identifications

Treatment Group X **N=50**

	Mild		Moderate		Severe		Total		Total
	Related*	NR*	Related	NR	Related	NR	Related	NR	R+NR
Body System A Event 1	6 (12%) N11** N12 N13 N14 N15 N16	2 (4%) N21 N22	3 (6%) N31 N32 N33	1 (2%) N41	3 (6%) N51 N52 N53	1 (2%) N61	12 (24%)	4 (8%)	
Event 2									

*NR = not related; related could be expanded, e.g. as definite, probable, possible
**Patient identification number

In addition to these complete tables provided in 14.3.1, an additional summary table comparing treatment and control groups, without the patient identifying numbers limited to relatively common adverse events (e.g. those in at least 1% of the treated group), should be provided in the body of the report.

In presenting adverse events, it is important both to display the original terms used by the investigator and to attempt to group related events (i.e. events that probably represent the same phenomena) so that the true occurrence rate is not obscured. One way to do this is with a standard adverse reaction/events dictionary.

12.2.3 ANALYSIS OF ADVERSE EVENTS

The basic display of adverse event rates described in section 12.2.2 (and located in section 14.3.1) of the report, should be used to compare rates in treatment and control groups. For this analysis it may be helpful to combine the event severity categories and the causality categories, leading to a simpler side-by-side comparison of treatment groups. In addition, although this is usually best done in an integrated analysis of safety, if study size and design permit, it may be useful to examine the more common adverse events that seem to be drug related for relationship to dosage and to mg/kg or mg/m^2 dose, to dose regimen, to duration of treatment, to total dose, to demographic characteristics such as age, sex, race, to other baseline features such as renal status, to efficacy outcomes, and to drug concentration. It may also be useful to examine time of onset and duration of adverse events. A variety of additional analyses may be suggested by the study results or by the pharmacology of the test drug/investigational product.

It is not intended that every adverse event be subjected to rigorous statistical evaluation. It may be apparent from initial display and inspection of the data that a significant relation to demographic or other baseline features is not present. If the

studies are small and if the number of events is relatively small, it may be sufficient to limit analyses to a comparison of treatment and control.

Under certain circumstances, life table or similar analyses may be more informative than reporting of crude adverse event rates. When treatments are cyclical, e.g. cancer chemotherapy, it may also be helpful to analyse results separately for each cycle.

12.2.4 LISTING OF ADVERSE EVENTS BY PATIENT

All adverse events for each patient, including the same event on several occasions should be listed in appendix 16.2.7, giving both preferred term and the original term used by the investigator. The listing should be by investigator and by treatment group and should include:

- Patient identifier
- Age, race, sex, weight (height, if relevant)
- Location of CRFs, if provided
- The adverse event (preferred term, reported term)
- Duration of the adverse event
- Severity (e.g. mild, moderate, severe)
- Seriousness (serious/non-serious)
- Action taken (none, dose reduced, treatment stopped, specific treatment instituted etc.)
- Outcome (e.g. CIOMS format)
- Causality assessment (e.g. related/not related). How this was determined should be described in the table or elsewhere
- Date of onset or date of clinic visit at which the event was discovered
- Timing of onset of the adverse event in relation to last dose of test drug/investigational product (when applicable)
- Study treatment at time of event or most recent study treatment taken
- Test drug/investigational product dose in absolute amount, mg/kg or mg/m^2 at time of event
- Drug concentration (if known)
- Duration of test drug/investigational product treatment
- Concomitant treatment during study.

Any abbreviations and codes should be clearly explained at the beginning of the listing or, preferably, on each page.

12.3 Deaths, Other Serious Adverse Events, and Other Significant Adverse Events

Deaths, other serious adverse events, and other significant adverse events deserve special attention.

12.3.1 LISTING OF DEATHS, OTHER SERIOUS ADVERSE EVENTS AND OTHER SIGNIFICANT ADVERSE EVENTS

Listings, containing the same information as called for in section 12.2.4 above, should be provided for the following events.

12.3.1.1 Deaths

All deaths during the study, including the post treatment follow-up period, and deaths that resulted from a process that began during the study, should be listed by patient in section 14.3.2.

12.3.1.2 Other Serious Adverse Events

All serious adverse events (other than death but including the serious adverse events temporally associated with or preceding the deaths) should be listed in section 14.3.2. The listing should include laboratory abnormalities, abnormal vital signs and abnormal physical observations that were considered serious adverse events.

12.3.1.3 Other Significant Adverse Events

Marked haematological and other laboratory abnormalities (other than those meeting the definition of serious) and any events that led to an intervention, including withdrawal of test drug/investigational product treatment, dose reduction, or significant additional concomitant therapy, other than those reported as serious adverse events, should be listed in section 14.3.2.

12.3.2 NARRATIVES OF DEATHS, OTHER SERIOUS ADVERSE EVENTS AND CERTAIN OTHER SIGNIFICANT ADVERSE EVENTS

There should be brief narratives describing each death, each other serious adverse event, and those of the other significant adverse events that are judged to be of special interest because of clinical importance. These narratives can be placed either in the text of the report or in section 14.3.3, depending on their number. Events that were clearly unrelated to the test drug/investigational product may be omitted or described very briefly. In general, the narrative should describe the following:

> the nature and intensity of event, the clinical course leading up to event, with an indication of timing relevant to test drug/investigational product administration; relevant laboratory measurements, whether the drug was stopped, and when; countermeasures; post mortem findings; investigator's opinion on causality, and sponsor's opinion on causality, if appropriate.

In addition, the following information should be included:

- Patient identifier
- Age and sex of patient; general clinical condition of patient, if appropriate
- Disease being treated (if the same for all patients this is not required) with duration (of current episode) of illness
- Relevant concomitant/previous illnesses with details of occurrence/duration
- Relevant concomitant/previous medication with details of dosage

– Test drug/investigational product administered, drug dose, if this varied among patients, and length of time administered.

12.3.3 ANALYSIS AND DISCUSSION OF DEATHS, OTHER SERIOUS ADVERSE EVENTS AND OTHER SIGNIFICANT ADVERSE EVENTS

The significance of the deaths, other serious adverse events and other significant adverse events leading to withdrawal, dose reduction or institution of concomitant therapy should be assessed with respect to the safety of the test drug/investigational product. Particular attention should be paid to whether any of these events may represent a previously unsuspected important adverse effect of the test drug/investigational product. For serious adverse events that appear of particular importance, it may be useful to use life table or similar analyses to show their relation to time on test drug/investigational product and to assess their risk over time.

12.4 Clinical Laboratory Evaluation

12.4.1 LISTING OF INDIVIDUAL LABORATORY MEASUREMENTS BY PATIENT (16.2.8) AND EACH ABNORMAL LABORATORY VALUE (14.3.4)

When required by regulatory authorities, the results of all safety-related laboratory tests should be available in tabular listings, using a display similar to the following, where each row represents a patient visit at which a laboratory study was done, with patients grouped by investigator (if more than one) and treatment group, and columns include critical demographic data, drug dose data, and the results of the laboratory tests. As not all tests can be displayed in a single table, they should be grouped logically (haematological tests, liver chemistries, electrolytes, urinalysis etc.). Abnormal values should be identified, e.g. by underlining, bracketing etc. These listings should be submitted as part of the registration/marketing application, when this is required, or may be available on request.

List of Laboratory Measurements

Patient	Time	Age	Sex	Race	Weight	Dose	Laboratory Tests		
							SGOT	SGPT	AP.....X
# 1	T0	70	M	W	70 kg	400 mg	V1*	V5	V9
	T1						V2	V6	V10
	T2						V3	V7	V11
	T3						V4	V8	V12
# 2	T10	65	F	B	59 kg	300 mg	V13	V16	V19
	T21						V14	V17	V20
	T32						V15	V18	V21

* Vn = value of a particular test

For all regulatory authorities, there should be a by-patient listing of all abnormal laboratory values in section 14.3.4, using the format described above. For laboratory abnormalities of special interest (abnormal laboratory values of potential clinical importance), it may also be useful to provide additional data, such as normal

values before and after the abnormal value, and values of related laboratory tests. In some cases, it may be desirable to exclude certain abnormal values from further analysis. For example, single, non-replicated, small abnormalities of some tests (e.g. uric acid or electrolytes) or occasional low values of some tests (e.g. transaminase, alkaline phosphatase, BUN etc.) can probably be defined as clinically insignificant and excluded. Any such decisions should be clearly explained, however, and the complete list of values provided (or available to authorities on request) should identify every abnormal value.

12.4.2 EVALUATION OF EACH LABORATORY PARAMETER

The necessary evaluation of laboratory values must in part be determined by the results seen, but, in general, the following analyses should be provided. For each analysis, comparison of the treatment and control groups should be carried out, as appropriate, and as compatible with study size. In addition, normal laboratory ranges should be given for each analysis.

12.4.2.1 Laboratory Values Over Time

For each parameter at each time over the course of the study (e.g. at each visit) the following should be described: the group mean or median values, the range of values, and the number of patients with abnormal values, or with abnormal values that are of a certain size (e.g. twice the upper limit of normal, 5 times the upper limit; choices should be explained). Graphs may be used.

12.4.2.2 Individual Patient Changes

An analysis of individual patient changes by treatment group should be given. A variety of approaches may be used, including:

I. "Shift tables" – These tables show the number of patients who are low, normal, or high at baseline and then at selected time intervals.

II. Tables showing the number or fraction of patients who had a change in parameter of a predetermined size at selected time intervals. For example, for BUN, it might be decided that a change of more than 10 mg/dL BUN should be noted. For this parameter, the number of patients having a change less than this or greater than this would be shown for one or more visits, usually grouping patients separately depending on baseline BUN (normal or elevated). The possible advantage of this display, compared to the usual shift table, is that changes of a certain size are noted, even if the final value is not abnormal.

III. A graph comparing the initial value and the on-treatment values of a laboratory measurement for each patient by locating the point defined by the initial value on the abscissa and a subsequent value on the ordinate. If no changes occur, the point representing each patient will be located on the 45° line. A general shift to higher values will show a clustering of points above the 45° line. As this display usually shows only a single time point for a single treatment, interpretation requires a time series of these plots for treatment and control groups. Alternatively the display could show baseline and most extreme

on-treatment value. These displays identify outliers readily (it is useful to include patient identifiers for the outliers).

12.4.2.3 Individual Clinically Significant Abnormalities

Clinically significant changes (defined by the applicant) should be discussed. A narrative of each patient whose laboratory abnormality was considered a serious adverse event and, in certain cases, considered an other significant adverse event, should be provided under sections 12.3.2 or 14.3.3. When toxicity grading scales are used (e.g. WHO, NCI), changes graded as severe should be discussed regardless of seriousness. An analysis of the clinically significant changes, together with a recapitulation of discontinuations due to laboratory measurements, should be provided for each parameter. The significance of the changes and likely relation to the treatment should be assessed, e.g. by analysis of such features as relationship to dose, relationship to drug concentration, disappearance on continued therapy, positive dechallenge, positive rechallenge, and the nature of concomitant therapy.

12.5 Vital Signs, Physical Findings and Other Observations Related to Safety

Vital signs, other physical findings, and other observations related to safety should be analysed and presented in a way similar to laboratory variables. If there is evidence of a drug effect, any dose-response or drug concentration-response relationship or relationship to patient variables (e.g. disease, demographics, concomitant therapy) should be identified and the clinical relevance of the observation described. Particular attention should be given to changes not evaluated as efficacy variables and to those considered to be adverse events.

12.6 Safety Conclusions

The overall safety evaluation of the test drug(s)/investigational product(s) should be reviewed, with particular attention to events resulting in changes of dose or need for concomitant medication, serious adverse events, events resulting in withdrawal, and deaths. Any patients or patient groups at increased risk should be identified and particular attention paid to potentially vulnerable patients who may be present in small numbers, e.g. children, pregnant women, frail elderly, people with marked abnormalities of drug metabolism or excretion etc. The implication of the safety evaluation for the possible uses of the drug should be described.

13. DISCUSSION AND OVERALL CONCLUSIONS

The efficacy and safety results of the study and the relationship of risks and benefit should be briefly summarized and discussed, referring to the tables, figures, and sections above as needed. The presentation should not simply repeat the description of results nor introduce new results.

The discussion and conclusions should clearly identify any new or unexpected findings, comment on their significance and discuss any potential problems such as inconsistencies between related measures. The clinical relevance and importance of the results should also be discussed in the light of other existing data. Any specific

benefits or special precautions required for individual subjects or at-risk groups and any implications for the conduct of future studies should be identified. Alternatively, such discussions may be reserved for summaries of safety and efficacy referring to the entire dossier (integrated summaries).

14. TABLES, FIGURES AND GRAPHS REFERRED TO BUT NOT INCLUDED IN THE TEXT

Figures should be used to visually summarize the important results, or to clarify results that are not easily understood from tables.

Important demographic, efficacy and safety data should be presented in summary figures or tables in the text of the report. However, if these become obtrusive because of size or number they should be presented here, cross-referenced to the text, along with supportive, or additional, figures, tables or listings.

The following information may be presented in this section of the core clinical study report:

14.1 Demographic Data

Summary figures and tables

14.2 Efficacy Data

Summary figures and tables

14.3 Safety Data

Summary figures and tables

14.3.1 DISPLAYS OF ADVERSE EVENTS

14.3.2 LISTINGS OF DEATHS, OTHER SERIOUS AND SIGNIFICANT ADVERSE EVENTS

14.3.3 NARRATIVES OF DEATHS, OTHER SERIOUS AND CERTAIN OTHER SIGNIFICANT ADVERSE EVENTS

14.3.4 ABNORMAL LABORATORY VALUE LISTING (EACH PATIENT)

15. REFERENCE LIST

A list of articles from the literature pertinent to the evaluation of the study should be provided. Copies of important publications should be attached in an appendix (16.1.11 and 16.1.12). References should be given in accordance with the internationally accepted standards of the 1979 Vancouver Declaration on "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" or the system used in "Chemical Abstracts".

16. APPENDICES

This section should be prefaced by a full list of all appendices available for the study report. Where permitted by the regulatory authority, some of the following appendices need not be submitted with the report but need to be provided only on request.

The applicant should therefore clearly indicate those appendices that are submitted with the report.

N.B. In order to have appendices available on request, they should be finalized by the time of filing of the submission.

16.1 Study Information

16.1.1 Protocol and protocol amendments

16.1.2 Sample case report form (unique pages only)

16.1.3 List of IECs or IRBs (plus the name of the committee Chair if required by the regulatory authority) – Representative written information for patient and sample consent forms

16.1.4 List and description of investigators and other important participants in the study, including brief (1 page) CVs or equivalent summaries of training and experience relevant to the performance of the clinical study

16.1.5 Signatures of principal or coordinating investigator(s) or sponsor's responsible medical officer, depending on the regulatory authority's requirement

16.1.6 Listing of patients receiving test drug(s)/investigational product(s) from specific batches, where more than one batch was used

16.1.7 Randomization scheme and codes (patient identification and treatment assigned)

16.1.8 Audit certificates (if available) (see Annex IVa and IVb of the guideline)

16.1.9 Documentation of statistical methods

16.1.10 Documentation of inter-laboratory standardization methods and quality assurance procedures if used

16.1.11 Publications based on the study

16.1.12 Important publications referenced in the report

16.2 Patient Data Listings

16.2.1 Discontinued patients

16.2.2 Protocol deviations

16.2.3 Patients excluded from the efficacy analysis

16.2.4 Demographic data

16.2.5 Compliance and/or drug concentration data (if available)

16.2.6 Individual efficacy response data

16.2.7 Adverse event listings (each patient)

16.2.8 Listing of individual laboratory measurements by patient, when required by regulatory authorities

16.3 Case Report Forms

16.3.1 CRFs for deaths, other serious adverse events and withdrawals for AE

16.3.2 Other CRFs submitted

16.4 Individual Patient Data Listings (US Archival Listings)

Annex I

SYNOPSIS

<table>
<tr><td>Name of Sponsor/Company:</td><td rowspan="3">Individual Study Table Referring to Part of the Dossier

Volume:

Page:</td><td rowspan="3">(For National Authority Use only)</td></tr>
<tr><td>Name of Finished Product:</td></tr>
<tr><td>Name of Active Ingredient:</td></tr>
<tr><td colspan="3">Title of Study:</td></tr>
<tr><td colspan="3">Investigators:</td></tr>
<tr><td colspan="3">Study centre(s):</td></tr>
<tr><td colspan="3">Publication (reference):</td></tr>
<tr><td>Studied period (years):
(date of first enrolment)
(date of last completed)</td><td colspan="2">Phase of development:</td></tr>
<tr><td colspan="3">Objectives:</td></tr>
<tr><td colspan="3">Methodology:</td></tr>
<tr><td colspan="3">Number of patients (planned and analysed):</td></tr>
<tr><td colspan="3">Diagnosis and main criteria for inclusion:</td></tr>
<tr><td colspan="3">Test product, dose and mode of administration, batch number:</td></tr>
<tr><td colspan="3">Duration of treatment:</td></tr>
<tr><td colspan="3">Reference therapy, dose and mode of administration, batch number:</td></tr>
</table>

Annex I – *continued*

<table>
<tr><td>Name of Sponsor/Company:</td><td rowspan="3">Individual Study Table Referring to Part of the Dossier

Volume:

Page:</td><td rowspan="3">(For National Authority Use only)</td></tr>
<tr><td>Name of Finished Product:</td></tr>
<tr><td>Name of Active Ingredient:</td></tr>
<tr><td colspan="3">Criteria for evaluation:
Efficacy:

Safety:</td></tr>
<tr><td colspan="3">Statistical methods:</td></tr>
<tr><td colspan="3">SUMMARY – CONCLUSIONS

EFFICACY RESULTS:

SAFETY RESULTS:

CONCLUSION:

Date of the report:</td></tr>
</table>

Annex II

PRINCIPAL OR COORDINATING INVESTIGATOR(S) SIGNATURE(S)
or Sponsor's Responsible Medical Officer

STUDY TITLE: .....

STUDY AUTHOR(S): .....

I have read this report and confirm that to the best of my knowledge it accurately describes the conduct and results of the study

INVESTIGATOR: ..... SIGNATURE(S) .....
OR SPONSOR'S RESPONSIBLE
MEDICAL OFFICER

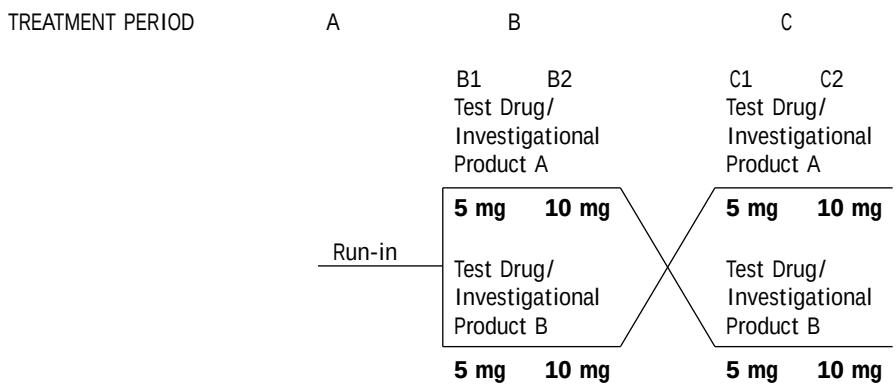
AFFILIATION: ....

.....

DATE: .....

Annex IIIa

STUDY DESIGN AND SCHEDULE OF ASSESSMENTS

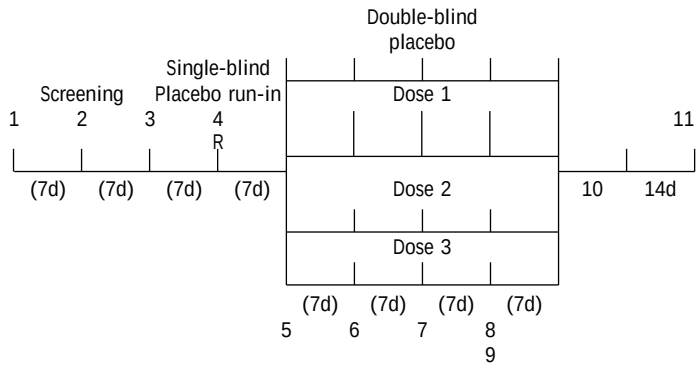


Week	−2 (−3)		0	3	6	9	12
Visit	1		2	3	4	5	6
Exercise test 24 h		x[1]	x[2]	x	x	x	x
Medical history	x						
Physical examination	x						x
ECG	x						x
Lab. invest.	x						x
Adverse events			x	x	x	x	x

1 = 14-20 days after visit 1
2 = 1-7 days after the first exercise test

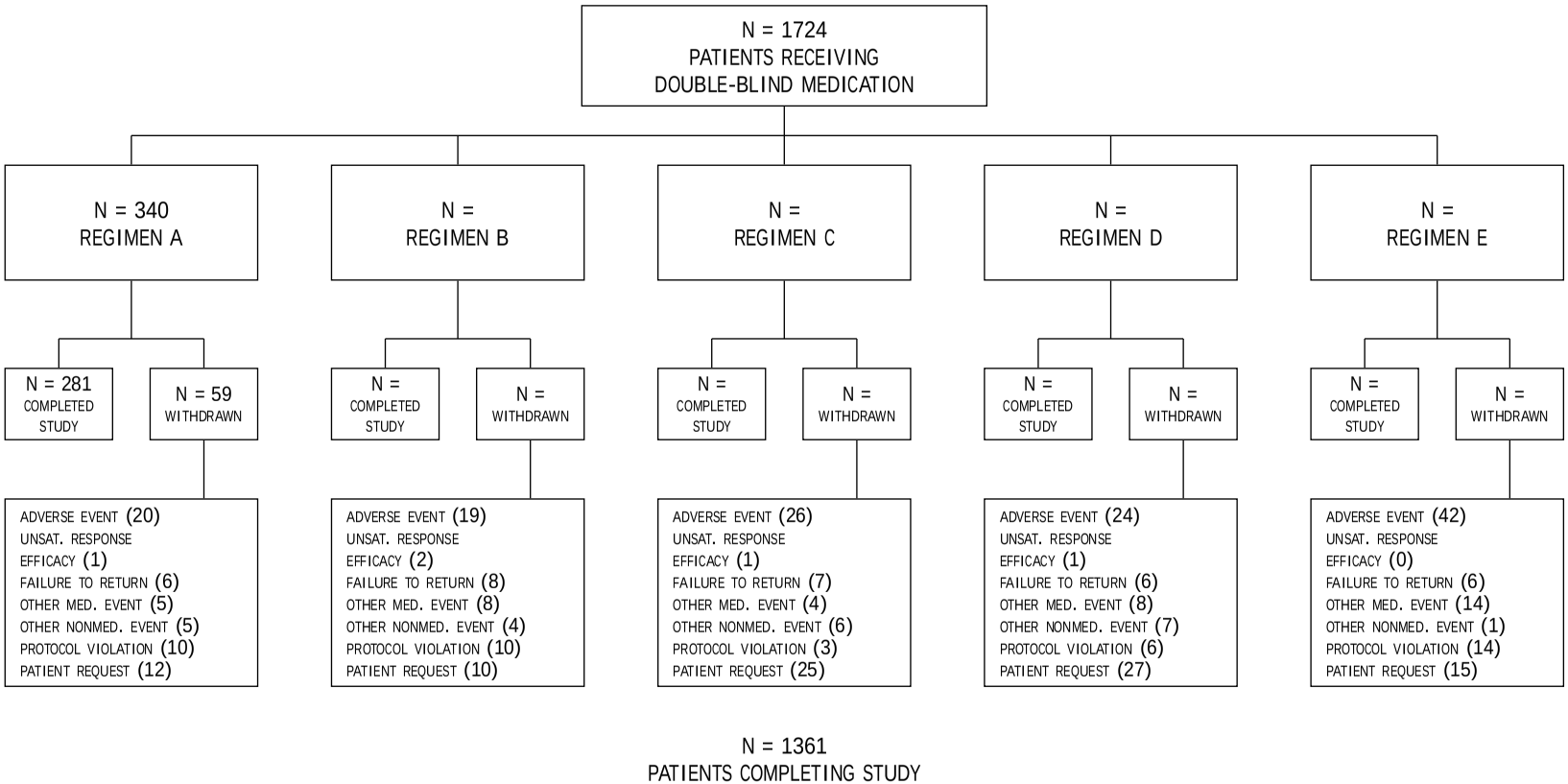
Annex IIIb

STUDY DESIGN AND SCHEDULE OF ASSESSMENTS

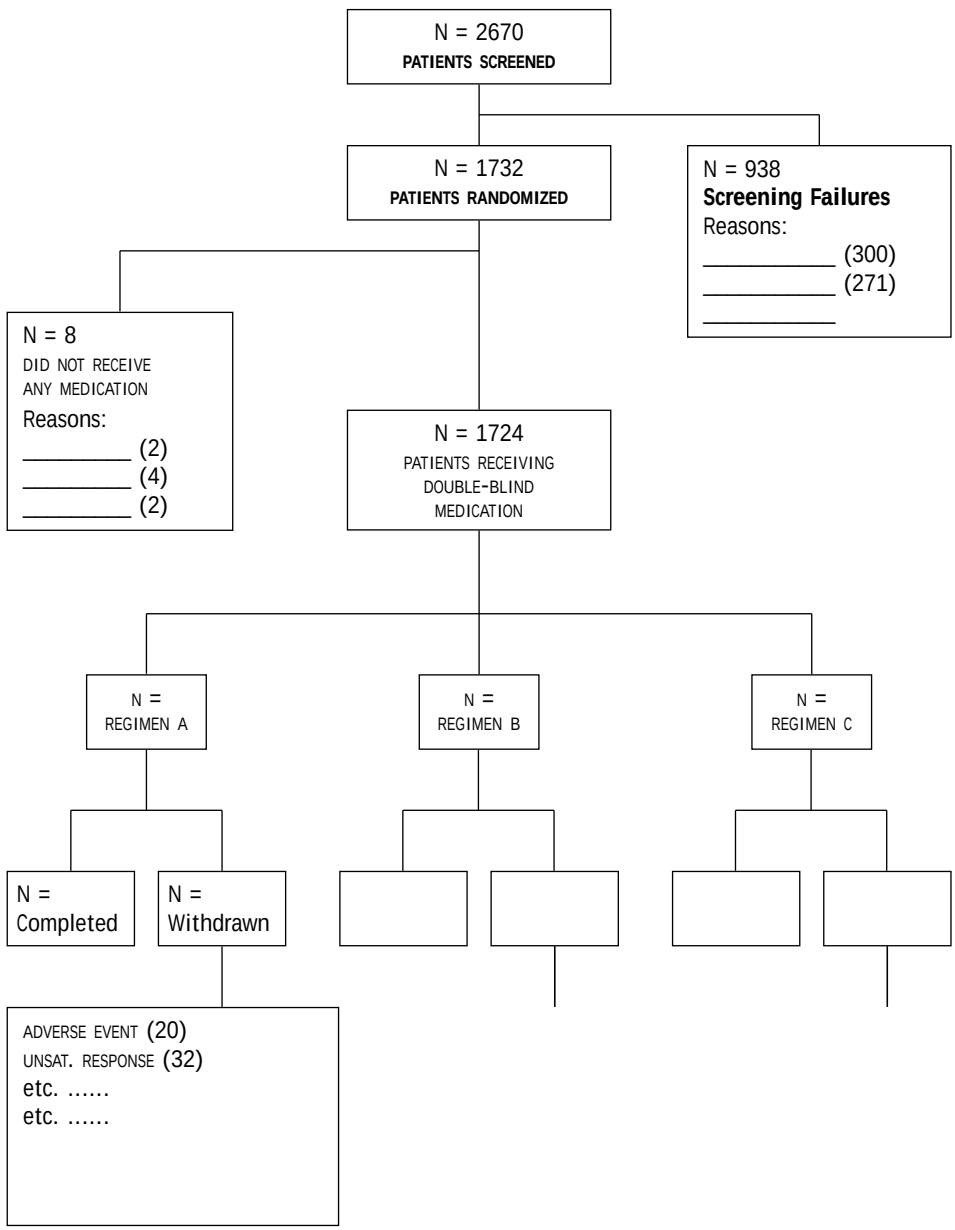


Assessment	Screening	Run-in	Baseline		Treatment				Follow-up	
Study Week	–2	–1	0	1	2	3	4	5	6	8
Informed consent	x									
History	x									
Physical exam.	x									
Effectiveness										
Primary variable	x	x	x	x	x	x	x	x	x	x
Secondary variable	x	x	x	x		x			x	x
Safety										
Adverse events	x	x	x	x	x	x	x	x	x	x
Lab. tests	x	x	x			x		x	x	
Body weight	x		x						x	x

Annex IVa


N = 1724
PATIENTS RECEIVING
DOUBLE-BLIND MEDICATION
N = 340
REGIMEN A
N =
REGIMEN B
N =
REGIMEN C
N =
REGIMEN D
N =
REGIMEN E
N = 281
COMPLETED
STUDY
N = 59
WITHDRAWN
N =
COMPLETED
STUDY
N =
WITHDRAWN
N =
COMPLETED
STUDY
N =
WITHDRAWN
N =
COMPLETED
STUDY
N =
WITHDRAWN
N =
COMPLETED
STUDY
N =
WITHDRAWN
ADVERSE EVENT (20)
UNSAT. RESPONSE
EFFICACY (1)
FAILURE TO RETURN (6)
OTHER MED. EVENT (5)
OTHER NONMED. EVENT (5)
PROTOCOL VIOLATION (10)
PATIENT REQUEST (12)
ADVERSE EVENT (19)
UNSAT. RESPONSE
EFFICACY (2)
FAILURE TO RETURN (8)
OTHER MED. EVENT (8)
OTHER NONMED. EVENT (4)
PROTOCOL VIOLATION (10)
PATIENT REQUEST (10)
ADVERSE EVENT (26)
UNSAT. RESPONSE
EFFICACY (1)
FAILURE TO RETURN (7)
OTHER MED. EVENT (4)
OTHER NONMED. EVENT (6)
PROTOCOL VIOLATION (3)
PATIENT REQUEST (25)
ADVERSE EVENT (24)
UNSAT. RESPONSE
EFFICACY (1)
FAILURE TO RETURN (6)
OTHER MED. EVENT (8)
OTHER NONMED. EVENT (7)
PROTOCOL VIOLATION (6)
PATIENT REQUEST (27)
ADVERSE EVENT (42)
UNSAT. RESPONSE
EFFICACY (0)
FAILURE TO RETURN (6)
OTHER MED. EVENT (14)
OTHER NONMED. EVENT (1)
PROTOCOL VIOLATION (14)
PATIENT REQUEST (15)
N = 1361
PATIENTS COMPLETING STUDY

Annex IVb


N = 2670
PATIENTS SCREENED
N = 1732
PATIENTS RANDOMIZED
N = 938
Screening Failures
Reasons:
_____ (300)
_____ (271)
_____
N = 8
DID NOT RECEIVE
ANY MEDICATION
Reasons:
_____ (2)
_____ (4)
_____ (2)
N = 1724
PATIENTS RECEIVING
DOUBLE-BLIND
MEDICATION
N =
REGIMEN A
N =
REGIMEN B
N =
REGIMEN C
N =
Completed
N =
Withdrawn
ADVERSE EVENT (20)
UNSAT. RESPONSE (32)
etc. .....
etc. .....

Annex V

STUDY
(Data Set Identification)

Listing of Patients who Discontinued Therapy

Centre:

Treatment	Patient #	Sex	Age	Last Visit	Duration	Dose	Concomitant Medication	Reason for Discontin.
Test Drug/ investigational product								Adverse reaction* • • • Therapy failure

Treatment	Patient #	Sex	Age	Last Visit	Duration	Dose	Concomitant Medication	Reason for Discontin.
Active Control/ Comparator								

Treatment	Patient #	Sex	Age	Last Visit	Duration	Dose	Concomitant Medication	Reason for Discontin.
Placebo								

*The specific reaction leading to discontinuation

(Repeat for other centres)

Annex VI

STUDY
(Data Set Identification)

Listing of Patients and Observations Excluded from Efficacy Analysis

Centre:

Treatment	Patient #	Sex	Age	Observation Excluded	Reason(s)
Test Drug/Investigational Product					

Treatment	Patient #	Sex	Age	Observation Excluded	Reason(s)
Active Drug/Comparator					

Treatment	Patient #	Sex	Age	Observation Excluded	Reason(s)
Placebo					

(Repeat for other centres)

Reference Tables

Summary:

Annex VII

STUDY
(Data Set Identification)

Number of Patients Excluded from Efficacy Analysis

Test Drug/Investigational Product **N =**

	Week			
Reason	**1**	**2**	**4**	**8**
Total				

Similar tables should be prepared for the other treatment groups.

Annex VIII

GUIDANCE FOR SECTION 11.4.2 – STATISTICAL/ANALYTICAL ISSUES AND APPENDIX 16.1.9

A. Statistical Considerations

Details of the statistical analysis performed on each primary efficacy variable should be presented in an appendix. Details reported should include at least the following information:

a) The statistical model underlying the analysis. This should be presented precisely and completely, using references if necessary.

b) A statement of the clinical claim tested in precise statistical terms, e.g., in terms of null and alternative hypotheses.

c) The statistical methods applied to estimate effects, construct confidence intervals etc. Literature references should be included where appropriate.

d) The assumptions underlying the statistical methods. It should be shown, insofar as statistically reasonable, that the data satisfy crucial assumptions, especially when necessary to confirm the validity of an inference. When extensive statistical analyses have been performed by the applicant, it is essential to consider the extent to which the analyses were planned prior to the availability of data and, if they were not, how bias was avoided in choosing the particular analysis used as a basis for conclusions. This is particularly important in the case of any subgroup analyses, because if such analyses are not preplanned they will ordinarily not provide an adequate basis for definitive conclusions.

   (i) In the event data transformation was performed, a rationale for the choice of data transformation along with interpretation of the estimates of treatment effects based on transformed data should be provided.

   (ii) A discussion of the appropriateness of the choice of statistical procedure and the validity of statistical conclusions will guide the regulatory authority's statistical reviewer in determining whether reanalysis of data is needed.

e) The test statistic, the sampling distribution of the test statistic under the null hypothesis, the value of the test statistic, significance level (i.e. p-value), and intermediate summary data, in a format that enables the regulatory authority's statistical reviewer to verify the results of the analysis quickly and easily. The p-values should be designated as one- or two-tailed. The rationale for using a one-tailed test should be provided.

   For example, the documentation of a two-sample t-test should consist of the value of the t-statistic, the associated degrees of freedom, the p-value, the two sample sizes, mean and variance for each of the samples, and the pooled estimate of variance. The documentation of multi-centre studies analysed by analysis of variance techniques should include, at a minimum, an analysis of

variance table with terms for centres, treatments, their interaction, error, and total. For cross-over designs, the documentation should include information regarding sequences, patients within sequences, baselines at the start of each period, washouts and length of washouts, dropouts during each period, treatments, periods, treatment by period interaction, error, and total. For each source of variation, aside from the total, the table should contain the degrees of freedom, the sum of squares, the mean square, the appropriate F-test, the p-value, and the expected mean square.

Intermediate summary data should display the demographic data and response data, averaged or otherwise summarized, for each centre-by-treatment combination (or other design characteristic such as sequence) at each observation time.

B. Format and Specifications for Submission of Data Requested by Regulatory Authority's Statistical Reviewers

In the report of each controlled clinical study, there should be data listings (tabulations) of patient data utilized by the sponsor for statistical analyses and tables supporting conclusions and major findings. These data listings are necessary for the regulatory authority's statistical review, and the sponsor may be asked to supply these patient data listings in a computer-readable form.

INTERNATIONAL CONFERENCE ON HARMONISATION OF
TECHNICAL REQUIREMENTS FOR REGISTRATION OF PHARMACEUTICALS
FOR HUMAN USE

ICH Harmonised Tripartite Guideline

GUIDELINE FOR GOOD CLINICAL PRACTICE

Recommended for Adoption
at Step 4 of the ICH Process
on 1 May 1996
by the ICH Steering Committee

This Guideline has been developed by the appropriate ICH Expert Working Group and has been subject to consultation by the regulatory parties, in accordance with the ICH Process. At Step 4 of the Process the final draft is recommended for adoption to the regulatory bodies of the European Union, Japan and USA.

GUIDELINE FOR GOOD CLINICAL PRACTICE

ICH Harmonised Tripartite Guideline

Having reached Step 4 of the ICH Process at the ICH Steering Committee meeting on 1 May 1996, this guideline is recommended for adoption to the three regulatory parties to ICH

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GUIDELINE FOR GOOD CLINICAL PRACTICE

INTRODUCTION

Good Clinical Practice (GCP) is an international ethical and scientific quality standard for designing, conducting, recording and reporting trials that involve the participation of human subjects. Compliance with this standard provides public assurance that the rights, safety and well-being of trial subjects are protected, consistent with the principles that have their origin in the Declaration of Helsinki, and that the clinical trial data are credible.

The objective of this ICH GCP Guideline is to provide a unified standard for the European Union (EU), Japan and the United States to facilitate the mutual acceptance of clinical data by the regulatory authorities in these jurisdictions.

The guideline was developed with consideration of the current good clinical practices of the European Union, Japan, and the United States, as well as those of Australia, Canada, the Nordic countries and the World Health Organization (WHO).

This guideline should be followed when generating clinical trial data that are intended to be submitted to regulatory authorities.

The principles established in this guideline may also be applied to other clinical investigations that may have an impact on the safety and well-being of human subjects.

1. GLOSSARY

1.1 Adverse Drug Reaction (ADR)

In the pre-approval clinical experience with a new medicinal product or its new usages, particularly as the therapeutic dose(s) may not be established: all noxious and unintended responses to a medicinal product related to any dose should be considered adverse drug reactions. The phrase responses to a medicinal product means that a causal relationship between a medicinal product and an adverse event is at least a reasonable possibility, i.e. the relationship cannot be ruled out.

Regarding marketed medicinal products: a response to a drug which is noxious and unintended and which occurs at doses normally used in man for prophylaxis, diagnosis, or therapy of diseases or for modification of physiological function (see the ICH Guideline for Clinical Safety Data Management: Definitions and Standards for Expedited Reporting).

1.2 Adverse Event (AE)

Any untoward medical occurrence in a patient or clinical investigation subject administered a pharmaceutical product and which does not necessarily have a causal relationship with this treatment. An adverse event (AE) can therefore be any unfavourable and unintended sign (including an abnormal laboratory finding), symptom, or disease temporally associated with the use of a medicinal (investigational) product, whether or not related to the medicinal (investigational) product (see the ICH Guideline for Clinical Safety Data Management: Definitions and Standards for Expedited Reporting).

1.3 Amendment (to the protocol)

See Protocol Amendment.

1.4 Applicable Regulatory Requirement(s)

Any law(s) and regulation(s) addressing the conduct of clinical trials of investigational products.

1.5 Approval (in relation to Institutional Review Boards)

The affirmative decision of the IRB that the clinical trial has been reviewed and may be conducted at the institution site within the constraints set forth by the IRB, the institution, Good Clinical Practice (GCP), and the applicable regulatory requirements.

1.6 Audit

A systematic and independent examination of trial related activities and documents to determine whether the evaluated trial related activities were conducted, and the data were recorded, analysed and accurately reported according to the protocol, sponsor's standard operating procedures (SOPs), Good Clinical Practice (GCP), and the applicable regulatory requirement(s).

1.7 Audit Certificate

A declaration of confirmation by the auditor that an audit has taken place.

1.8 Audit Report

A written evaluation by the sponsor's auditor of the results of the audit.

1.9 Audit Trail

Documentation that allows reconstruction of the course of events.

1.10 Blinding/Masking

A procedure in which one or more parties to the trial are kept unaware of the treatment assignment(s). Single-blinding usually refers to the subject(s) being unaware, and double-blinding usually refers to the subject(s), investigator(s), monitor, and, in some cases, data analyst(s) being unaware of the treatment assignment(s).

1.11 Case Report Form (CRF)

A printed, optical, or electronic document designed to record all of the protocol required information to be reported to the sponsor on each trial subject.

1.12 Clinical Trial/Study

Any investigation in human subjects intended to discover or verify the clinical, pharmacological and/or other pharmacodynamic effects of an investigational product(s), and/or to identify any adverse reactions to an investigational product(s), and/or to study absorption, distribution, metabolism, and excretion of an investigational product(s) with the object of ascertaining its safety and/or efficacy. The terms clinical trial and clinical study are synonymous.

1.13 Clinical Trial/Study Report

A written description of a trial/study of any therapeutic, prophylactic, or diagnostic agent conducted in human subjects, in which the clinical and statistical description, presentations, and analyses are fully integrated into a single report (see the ICH Guideline for Structure and Content of Clinical Study Reports).

1.14 Comparator (Product)

An investigational or marketed product (i.e. active control), or placebo, used as a reference in a clinical trial.

1.15 Compliance (in relation to trials)

Adherence to all the trial-related requirements, Good Clinical Practice (GCP) requirements, and the applicable regulatory requirements.

1.16 Confidentiality

Prevention of disclosure, to other than authorized individuals, of a sponsor's proprietary information or of a subject's identity.

1.17 Contract

A written, dated, and signed agreement between two or more involved parties that sets out any arrangements on delegation and distribution of tasks and obligations and, if appropriate, on financial matters. The protocol may serve as the basis of a contract.

1.18 Coordinating Committee

A committee that a sponsor may organise to coordinate the conduct of a multicentre trial.

1.19 Coordinating Investigator

An investigator assigned the responsibility for the coordination of investigators at different centres participating in a multicentre trial.

1.20 Contract Research Organization (CRO)

A person or an organization (commercial, academic, or other) contracted by the sponsor to perform one or more of a sponsor's trial-related duties and functions.

1.21 Direct Access

Permission to examine, analyse, verify, and reproduce any records and reports that are important to evaluation of a clinical trial. Any party (e.g. domestic and foreign regulatory authorities, sponsor's monitors and auditors) with direct access should take all reasonable precautions within the constraints of the applicable regulatory requirement(s) to maintain the confidentiality of subjects' identities and sponsor's proprietary information.

1.22 Documentation

All records, in any form (including, but not limited to, written, electronic, magnetic, and optical records, and scans, x-rays, and electrocardiograms) that describe

or record the methods, conduct, and/or results of a trial, the factors affecting a trial, and the actions taken.

1.23 Essential Documents

Documents which individually and collectively permit evaluation of the conduct of a study and the quality of the data produced (see 8. Essential Documents for the Conduct of a Clinical Trial).

1.24 Good Clinical Practice (GCP)

A standard for the design, conduct, performance, monitoring, auditing, recording, analyses, and reporting of clinical trials that provides assurance that the data and reported results are credible and accurate, and that the rights, integrity, and confidentiality of trial subjects are protected.

1.25 Independent Data-Monitoring Committee (IDMC) (Data and Safety Monitoring Board, Monitoring Committee, Data Monitoring Committee)

An independent data-monitoring committee that may be established by the sponsor to assess at intervals the progress of a clinical trial, the safety data, and the critical efficacy endpoints, and to recommend to the sponsor whether to continue, modify, or stop a trial.

1.26 Impartial Witness

A person, who is independent of the trial, who cannot be unfairly influenced by people involved with the trial, who attends the informed consent process if the subject or the subject's legally acceptable representative cannot read, and who reads the informed consent form and any other written information supplied to the subject.

1.27 Independent Ethics Committee (IEC)

An independent body (a review board or a committee, institutional, regional, national, or supranational), constituted of medical professionals and non-medical members, whose responsibility it is to ensure the protection of the rights, safety and well-being of human subjects involved in a trial and to provide public assurance of that protection, by, among other things, reviewing and approving/providing favourable opinion on, the trial protocol, the suitability of the investigator(s), facilities, and the methods and material to be used in obtaining and documenting informed consent of the trial subjects.

The legal status, composition, function, operations and regulatory requirements pertaining to Independent Ethics Committees may differ among countries, but should allow the Independent Ethics Committee to act in agreement with GCP as described in this guideline.

1.28 Informed Consent

A process by which a subject voluntarily confirms his or her willingness to participate in a particular trial, after having been informed of all aspects of the trial that

are relevant to the subject's decision to participate. Informed consent is documented by means of a written, signed and dated informed consent form.

1.29 Inspection

The act by a regulatory authority(ies) of conducting an official review of documents, facilities, records, and any other resources that are deemed by the authority(ies) to be related to the clinical trial and that may be located at the site of the trial, at the sponsor's and/or contract research organization's (CRO's) facilities, or at other establishments deemed appropriate by the regulatory authority(ies).

1.30 Institution (medical)

Any public or private entity or agency or medical or dental facility where clinical trials are conducted.

1.31 Institutional Review Board (IRB)

An independent body constituted of medical, scientific, and non-scientific members, whose responsibility is to ensure the protection of the rights, safety and well-being of human subjects involved in a trial by, among other things, reviewing, approving, and providing continuing review of trial protocol and amendments and of the methods and material to be used in obtaining and documenting informed consent of the trial subjects.

1.32 Interim Clinical Trial/Study Report

A report of intermediate results and their evaluation based on analyses performed during the course of a trial.

1.33 Investigational Product

A pharmaceutical form of an active ingredient or placebo being tested or used as a reference in a clinical trial, including a product with a marketing authorization when used or assembled (formulated or packaged) in a way different from the approved form, or when used for an unapproved indication, or when used to gain further information about an approved use.

1.34 Investigator

A person responsible for the conduct of the clinical trial at a trial site. If a trial is conducted by a team of individuals at a trial site, the investigator is the responsible leader of the team and may be called the principal investigator. See also Sub-Investigator.

1.35 Investigator / Institution

An expression meaning "the investigator and/or institution, where required by the applicable regulatory requirements".

1.36 Investigator's Brochure

A compilation of the clinical and nonclinical data on the investigational product(s) which is relevant to the study of the investigational product(s) in human subjects (see 7. Investigator's Brochure).

1.37 Legally Acceptable Representative

An individual or juridical or other body authorized under applicable law to consent, on behalf of a prospective subject, to the subject's participation in the clinical trial.

1.38 Monitoring

The act of overseeing the progress of a clinical trial, and of ensuring that it is conducted, recorded, and reported in accordance with the protocol, Standard Operating Procedures (SOPs), Good Clinical Practice (GCP), and the applicable regulatory requirement(s).

1.39 Monitoring Report

A written report from the monitor to the sponsor after each site visit and/or other trial-related communication according to the sponsor's SOPs.

1.40 Multicentre Trial

A clinical trial conducted according to a single protocol but at more than one site, and therefore, carried out by more than one investigator.

1.41 Non-clinical Study

Biomedical studies not performed on human subjects.

1.42 Opinion (in relation to Independent Ethics Committee)

The judgement and/or the advice provided by an Independent Ethics Committee (IEC).

1.43 Original Medical Record

See Source Documents.

1.44 Protocol

A document that describes the objective(s), design, methodology, statistical considerations, and organization of a trial. The protocol usually also gives the background and rationale for the trial, but these could be provided in other protocol referenced documents. Throughout the ICH GCP Guideline the term protocol refers to protocol and protocol amendments.

1.45 Protocol Amendment

A written description of a change(s) to or formal clarification of a protocol.

1.46 Quality Assurance (QA)

All those planned and systematic actions that are established to ensure that the trial is performed and the data are generated, documented (recorded), and reported in compliance with Good Clinical Practice (GCP) and the applicable regulatory requirement(s).

1.47 Quality Control (QC)

The operational techniques and activities undertaken within the quality assurance system to verify that the requirements for quality of the trial-related activities have been fulfilled.

1.48 Randomization

The process of assigning trial subjects to treatment or control groups using an element of chance to determine the assignments in order to reduce bias.

1.49 Regulatory Authorities

Bodies having the power to regulate. In the ICH GCP guideline the expression Regulatory Authorities includes the authorities that review submitted clinical data and those that conduct inspections (see 1.29). These bodies are sometimes referred to as competent authorities.

1.50 Serious Adverse Event (SAE) or Serious Adverse Drug Reaction (Serious ADR)

Any untoward medical occurrence that at any dose:
– results in death,
– is life-threatening,
– requires inpatient hospitalization or prolongation of existing hospitalization,
– results in persistent or significant disability/incapacity,
or
– is a congenital anomaly/birth defect
(see the ICH Guideline for Clinical Safety Data Management: Definitions and Standards for Expedited Reporting).

1.51 Source Data

All information in original records and certified copies of original records of clinical findings, observations, or other activities in a clinical trial necessary for the reconstruction and evaluation of the trial. Source data are contained in source documents (original records or certified copies).

1.52 Source Documents

Original documents, data, and records (e.g. hospital records, clinical and office charts, laboratory notes, memoranda, subjects' diaries or evaluation checklists, pharmacy dispensing records, recorded data from automated instruments, copies or transcriptions certified after verification as being accurate copies, microfiches, photographic negatives, microfilm or magnetic media, x-rays, subject files, and records kept at the pharmacy, at the laboratories and at medico-technical departments involved in the clinical trial).

1.53 Sponsor

An individual, company, institution, or organization which takes responsibility for the initiation, management, and/or financing of a clinical trial.

1.54 Sponsor-Investigator

An individual who both initiates and conducts, alone or with others, a clinical trial, and under whose immediate direction the investigational product is administered to, dispensed to, or used by a subject. The term does not include any person other than an individual (e.g. it does not include a corporation or an agency). The obligations of a sponsor-investigator include both those of a sponsor and those of an investigator.

1.55 Standard Operating Procedures (SOPs)

Detailed, written instructions to achieve uniformity of the performance of a specific function.

1.56 Subinvestigator

Any individual member of the clinical trial team designated and supervised by the investigator at a trial site to perform critical trial-related procedures and/or to make important trial-related decisions (e.g. associates, residents, research fellows). See also Investigator.

1.57 Subject/Trial Subject

An individual who participates in a clinical trial, either as a recipient of the investigational product(s) or as a control.

1.58 Subject Identification Code

A unique identifier assigned by the investigator to each trial subject to protect the subject's identity and used in lieu of the subject's name when the investigator reports adverse events and/or other trial related data.

1.59 Trial Site

The location(s) where trial-related activities are actually conducted.

1.60 Unexpected Adverse Drug Reaction

An adverse reaction, the nature or severity of which is not consistent with the applicable product information (e.g. Investigator's Brochure for an unapproved investigational product or package insert/summary of product characteristics for an approved product) (see the ICH Guideline for Clinical Safety Data Management: Definitions and Standards for Expedited Reporting).

1.61 Vulnerable Subjects

Individuals whose willingness to volunteer in a clinical trial may be unduly influenced by the expectation, whether justified or not, of benefits associated with participation, or of a retaliatory response from senior members of a hierarchy in case of refusal to participate. Examples are members of a group with a hierarchical structure, such as medical, pharmacy, dental, and nursing students, subordinate hospital and laboratory personnel, employees of the pharmaceutical industry, members of

the armed forces, and persons kept in detention. Other vulnerable subjects include patients with incurable diseases, persons in nursing homes, unemployed or impoverished persons, patients in emergency situations, ethnic minority groups, homeless persons, nomads, refugees, minors, and those incapable of giving consent.

1.62 Well-being (of the trial subjects)

The physical and mental integrity of the subjects participating in a clinical trial.

2. THE PRINCIPLES OF ICH GCP

2.1 Clinical trials should be conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki, and that are consistent with GCP and the applicable regulatory requirement(s).

2.2 Before a trial is initiated, foreseeable risks and inconveniences should be weighed against the anticipated benefit for the individual trial subject and society. A trial should be initiated and continued only if the anticipated benefits justify the risks.

2.3 The rights, safety, and well-being of the trial subjects are the most important considerations and should prevail over interests of science and society.

2.4 The available non-clinical and clinical information on an investigational product should be adequate to support the proposed clinical trial.

2.5 Clinical trials should be scientifically sound, and described in a clear, detailed protocol.

2.6 A trial should be conducted in compliance with the protocol that has received prior institutional review board (IRB)/independent ethics committee (IEC) approval/favourable opinion.

2.7 The medical care given to, and medical decisions made on behalf of, subjects should always be the responsibility of a qualified physician or, when appropriate, of a qualified dentist.

2.8 Each individual involved in conducting a trial should be qualified by education, training, and experience to perform his or her respective task(s).

2.9 Freely given informed consent should be obtained from every subject prior to clinical trial participation.

2.10 All clinical trial information should be recorded, handled, and stored in a way that allows its accurate reporting, interpretation and verification.

2.11 The confidentiality of records that could identify subjects should be protected, respecting the privacy and confidentiality rules in accordance with the applicable regulatory requirement(s).

2.12 Investigational products should be manufactured, handled, and stored in accordance with applicable good manufacturing practice (GMP). They should be used in accordance with the approved protocol.

2.13 Systems with procedures that assure the quality of every aspect of the trial should be implemented.

3. INSTITUTIONAL REVIEW BOARD/INDEPENDENT ETHICS COMMITTEE (IRB/IEC)

3.1 Responsibilities

3.1.1 An IRB/IEC should safeguard the rights, safety, and well-being of all trial subjects. Special attention should be paid to trials that may include vulnerable subjects.

3.1.2 The IRB/IEC should obtain the following documents:

trial protocol(s)/amendment(s), written informed consent form(s) and consent form updates that the investigator proposes for use in the trial, subject recruitment procedures (e.g. advertisements), written information to be provided to subjects, Investigator's Brochure (IB), available safety information, information about payments and compensation available to subjects, the investigator's current curriculum vitae and/or other documentation evidencing qualifications, and any other documents that the IRB/IEC may need to fulfil its responsibilities.

The IRB/IEC should review a proposed clinical trial within a reasonable time and document its views in writing, clearly identifying the trial, the documents reviewed and the dates for the following:

- approval/favourable opinion;
- modifications required prior to its approval/favourable opinion;
- disapproval/negative opinion; and
- termination/suspension of any prior approval/favourable opinion.

3.1.3 The IRB/IEC should consider the qualifications of the investigator for the proposed trial, as documented by a current curriculum vitae and/or by any other relevant documentation the IRB/IEC requests.

3.1.4 The IRB/IEC should conduct continuing review of each ongoing trial at intervals appropriate to the degree of risk to human subjects, but at least once per year.

3.1.5 The IRB/IEC may request more information than is outlined in paragraph 4.8.10 be given to subjects when, in the judgement of the IRB/IEC, the additional information would add meaningfully to the protection of the rights, safety and/or well-being of the subjects.

3.1.6 When a non-therapeutic trial is to be carried out with the consent of the subject's legally acceptable representative (see 4.8.12, 4.8.14), the IRB/IEC should determine that the proposed protocol and/or other document(s) adequately addresses relevant ethical concerns and meets applicable regulatory requirements for such trials.

3.1.7 Where the protocol indicates that prior consent of the trial subject or the subject's legally acceptable representative is not possible (see 4.8.15), the IRB/IEC should determine that the proposed protocol and/or other document(s) adequately addresses relevant ethical concerns and meets applicable regulatory requirements for such trials (i.e. in emergency situations).

3.1.8 The IRB/IEC should review both the amount and method of payment to subjects to assure that neither presents problems of coercion or undue

influence on the trial subjects. Payments to a subject should be prorated and not wholly contingent on completion of the trial by the subject.

3.1.9 The IRB/IEC should ensure that information regarding payment to subjects, including the methods, amounts, and schedule of payment to trial subjects, is set forth in the written informed consent form and any other written information to be provided to subjects. The way payment will be prorated should be specified.

3.2 Composition, Functions and Operations

3.2.1 The IRB/IEC should consist of a reasonable number of members, who collectively have the qualifications and experience to review and evaluate the science, medical aspects, and ethics of the proposed trial. It is recommended that the IRB/IEC should include:

(a) At least five members.

(b) At least one member whose primary area of interest is in a non-scientific area.

(c) At least one member who is independent of the institution/trial site.

Only those IRB/IEC members who are independent of the investigator and the sponsor of the trial should vote/provide opinion on a trial-related matter.

A list of IRB/IEC members and their qualifications should be maintained.

3.2.2 The IRB/IEC should perform its functions according to written operating procedures, should maintain written records of its activities and minutes of its meetings, and should comply with GCP and with the applicable regulatory requirement(s).

3.2.3 An IRB/IEC should make its decisions at announced meetings at which at least a quorum, as stipulated in its written operating procedures, is present.

3.2.4 Only members who participate in the IRB/IEC review and discussion should vote/provide their opinion and/or advise.

3.2.5 The investigator may provide information on any aspect of the trial, but should not participate in the deliberations of the IRB/IEC or in the vote/opinion of the IRB/IEC.

3.2.6 An IRB/IEC may invite non-members with expertise in special areas for assistance.

3.3 Procedures

The IRB/IEC should establish, document in writing, and follow its procedures, which should include:

3.3.1 Determining its composition (names and qualifications of the members) and the authority under which it is established.

3.3.2 Scheduling, notifying its members of, and conducting its meetings.

3.3.3 Conducting initial and continuing review of trials.

3.3.4 Determining the frequency of continuing review, as appropriate.

3.3.5 Providing, according to the applicable regulatory requirements, expedited review and approval/favourable opinion of minor change(s) in ongoing trials that have the approval/favourable opinion of the IRB/IEC.

3.3.6 Specifying that no subject should be admitted to a trial before the IRB/IEC issues its written approval/favourable opinion of the trial.

3.3.7 Specifying that no deviations from, or changes of, the protocol should be initiated without prior written IRB/IEC approval/favourable opinion of an appropriate amendment, except when necessary to eliminate immediate hazards to the subjects or when the change(s) involves only logistical or administrative aspects of the trial (e.g. change of monitor(s), telephone number(s)) (see 4.5.2).

3.3.8 Specifying that the investigator should promptly report to the IRB/IEC:

(a) Deviations from, or changes of, the protocol to eliminate immediate hazards to the trial subjects (see 3.3.7, 4.5.2, 4.5.4).

(b) Changes increasing the risk to subjects and/or affecting significantly the conduct of the trial (see 4.10.2).

(c) All adverse drug reactions (ADRs) that are both serious and unexpected.

(d) New information that may affect adversely the safety of the subjects or the conduct of the trial.

3.3.9 Ensuring that the IRB/IEC promptly notify in writing the investigator/institution concerning:

(a) Its trial-related decisions/opinions.

(b) The reasons for its decisions/opinions.

(c) Procedures for appeal of its decisions/opinions.

3.4 Records

The IRB/IEC should retain all relevant records (e.g., written procedures, membership lists, lists of occupations/affiliations of members, submitted documents, minutes of meetings, and correspondence) for a period of at least 3 years after completion of the trial and make them available upon request from the regulatory authority(ies).

The IRB/IEC may be asked by investigators, sponsors or regulatory authorities to provide its written procedures and membership lists.

4. INVESTIGATOR

4.1 Investigator's Qualifications and Agreements

4.1.1 The investigator(s) should be qualified by education, training, and experience to assume responsibility for the proper conduct of the trial, should meet all the qualifications specified by the applicable regulatory requirement(s), and should provide evidence of such qualifications through up-

to-date curriculum vitae and/or other relevant documentation requested by the sponsor, the IRB/IEC, and/or the regulatory authority(ies).

4.1.2 The investigator should be thoroughly familiar with the appropriate use of the investigational product(s), as described in the protocol, in the current Investigator's Brochure, in the product information and in other information sources provided by the sponsor.

4.1.3 The investigator should be aware of, and should comply with, GCP and the applicable regulatory requirements.

4.1.4 The investigator/institution should permit monitoring and auditing by the sponsor, and inspection by the appropriate regulatory authority(ies).

4.1.5 The investigator should maintain a list of appropriately qualified persons to whom the investigator has delegated significant trial-related duties.

4.2 Adequate Resources

4.2.1 The investigator should be able to demonstrate (e.g. based on retrospective data) a potential for recruiting the required number of suitable subjects within the agreed recruitment period.

4.2.2 The investigator should have sufficient time to properly conduct and complete the trial within the agreed trial period.

4.2.3 The investigator should have available an adequate number of qualified staff and adequate facilities for the foreseen duration of the trial to conduct the trial properly and safely.

4.2.4 The investigator should ensure that all persons assisting with the trial are adequately informed about the protocol, the investigational product(s), and their trial-related duties and functions.

4.3 Medical Care of Trial Subjects

4.3.1 A qualified physician (or dentist, when appropriate), who is an investigator or a sub-investigator for the trial, should be responsible for all trial-related medical (or dental) decisions.

4.3.2 During and following a subject's participation in a trial, the investigator/institution should ensure that adequate medical care is provided to a subject for any adverse events, including clinically significant laboratory values, related to the trial. The investigator/institution should inform a subject when medical care is needed for intercurrent illness(es) of which the investigator becomes aware.

4.3.3 It is recommended that the investigator inform the subject's primary physician about the subject's participation in the trial if the subject has a primary physician and if the subject agrees to the primary physician being informed.

4.3.4 Although a subject is not obliged to give his/her reason(s) for withdrawing prematurely from a trial, the investigator should make a reasonable effort to ascertain the reason(s), while fully respecting the subject's rights.

4.4 Communication with IRB/IEC

4.4.1 Before initiating a trial, the investigator/institution should have written and dated approval/favourable opinion from the IRB/IEC for the trial protocol, written informed consent form, consent form updates, subject recruitment procedures (e.g. advertisements), and any other written information to be provided to subjects.

4.4.2 As part of the investigator's/institution's written application to the IRB/IEC, the investigator/institution should provide the IRB/IEC with a current copy of the Investigator's Brochure. If the Investigator's Brochure is updated during the trial, the investigator/institution should supply a copy of the updated Investigator's Brochure to the IRB/IEC.

4.4.3 During the trial the investigator/institution should provide to the IRB/IEC all documents subject to review.

4.5 Compliance with Protocol

4.5.1 The investigator/institution should conduct the trial in compliance with the protocol agreed to by the sponsor and, if required, by the regulatory authority(ies) and which was given approval/favourable opinion by the IRB/IEC. The investigator/institution and the sponsor should sign the protocol, or an alternative contract, to confirm agreement.

4.5.2 The investigator should not implement any deviation from, or changes of the protocol without agreement by the sponsor and prior review and documented approval/favourable opinion from the IRB/IEC of an amendment, except where necessary to eliminate an immediate hazard(s) to trial subjects, or when the change(s) involves only logistical or administrative aspects of the trial (e.g. change in monitor(s), change of telephone number(s)).

4.5.3 The investigator, or person designated by the investigator, should document and explain any deviation from the approved protocol.

4.5.4 The investigator may implement a deviation from, or a change of, the protocol to eliminate an immediate hazard(s) to trial subjects without prior IRB/IEC approval/favourable opinion. As soon as possible, the implemented deviation or change, the reasons for it, and, if appropriate, the proposed protocol amendment(s) should be submitted:

(a) to the IRB/IEC for review and approval/favourable opinion,

(b) to the sponsor for agreement and, if required,

(c) to the regulatory authority(ies).

4.6 Investigational Product(s)

4.6.1 Responsibility for investigational product(s) accountability at the trial site(s) rests with the investigator/institution.

4.6.2 Where allowed/required, the investigator/institution may/should assign some or all of the investigator's/institution's duties for investigational product(s) accountability at the trial site(s) to an appropriate pharmacist

or another appropriate individual who is under the supervision of the investigator/institution.

4.6.3 The investigator/institution and/or a pharmacist or other appropriate individual, who is designated by the investigator/institution, should maintain records of the product's delivery to the trial site, the inventory at the site, the use by each subject, and the return to the sponsor or alternative disposition of unused product(s). These records should include dates, quantities, batch/serial numbers, expiration dates (if applicable), and the unique code numbers assigned to the investigational product(s) and trial subjects. Investigators should maintain records that document adequately that the subjects were provided the doses specified by the protocol and reconcile all investigational product(s) received from the sponsor.

4.6.4 The investigational product(s) should be stored as specified by the sponsor (see 5.13.2 and 5.14.3) and in accordance with applicable regulatory requirement(s).

4.6.5 The investigator should ensure that the investigational product(s) are used only in accordance with the approved protocol.

4.6.6 The investigator, or a person designated by the investigator/institution, should explain the correct use of the investigational product(s) to each subject and should check, at intervals appropriate for the trial, that each subject is following the instructions properly.

4.7 Randomization Procedures and Unblinding

The investigator should follow the trial's randomisation procedures, if any, and should ensure that the code is broken only in accordance with the protocol. If the trial is blinded, the investigator should promptly document and explain to the sponsor any premature unblinding (e.g. accidental unblinding, unblinding due to a serious adverse event) of the investigational product(s).

4.8 Informed Consent of Trial Subjects

4.8.1 In obtaining and documenting informed consent, the investigator should comply with the applicable regulatory requirement(s), and should adhere to GCP and to the ethical principles that have their origin in the Declaration of Helsinki. Prior to the beginning of the trial, the investigator should have the IRB/IEC's written approval/favourable opinion of the written informed consent form and any other written information to be provided to subjects.

4.8.2 The written informed consent form and any other written information to be provided to subjects should be revised whenever important new informa-tion becomes available that may be relevant to the subject's consent. Any revised written informed consent form, and written information should receive the IRB/IEC's approval/favourable opinion in advance of use. The subject or the subject's legally acceptable representative should be informed in a timely manner if new information becomes available that

may be relevant to the subject's willingness to continue participation in the trial. The communication of this information should be documented.

4.8.3 Neither the investigator, nor the trial staff, should coerce or unduly influence a subject to participate or to continue to participate in a trial.

4.8.4 None of the oral and written information concerning the trial, including the written informed consent form, should contain any language that causes the subject or the subject's legally acceptable representative to waive or to appear to waive any legal rights, or that releases or appears to release the investigator, the institution, the sponsor, or their agents from liability for negligence.

4.8.5 The investigator, or a person designated by the investigator, should fully inform the subject or, if the subject is unable to provide informed consent, the subject's legally acceptable representative, of all pertinent aspects of the trial including the written information and the approval/ favourable opinion by the IRB/IEC.

4.8.6 The language used in the oral and written information about the trial, including the written informed consent form, should be as non-technical as practical and should be understandable to the subject or the subject's legally acceptable representative and the impartial witness, where applicable.

4.8.7 Before informed consent may be obtained, the investigator, or a person designated by the investigator, should provide the subject or the subject's legally acceptable representative ample time and opportunity to inquire about details of the trial and to decide whether or not to participate in the trial. All questions about the trial should be answered to the satisfaction of the subject or the subject's legally acceptable representative.

4.8.8 Prior to a subject's participation in the trial, the written informed consent form should be signed and personally dated by the subject or by the subject's legally acceptable representative, and by the person who conducted the informed consent discussion.

4.8.9 If a subject is unable to read or if a legally acceptable representative is unable to read, an impartial witness should be present during the entire informed consent discussion. After the written informed consent form and any other written information to be provided to subjects, is read and explained to the subject or the subject's legally acceptable representative, and after the subject or the subject's legally acceptable representative has orally consented to the subject's participation in the trial and, if capable of doing so, has signed and personally dated the informed consent form, the witness should sign and personally date the consent form. By signing the consent form, the witness attests that the information in the consent form and any other written information was accurately explained to, and apparently understood by, the subject or the subject's legally acceptable representative, and that informed consent was freely given by the subject or the subject's legally acceptable representative.

4.8.10 Both the informed consent discussion and the written informed consent form and any other written information to be provided to subjects should include explanations of the following:

(a) That the trial involves research.

(b) The purpose of the trial.

(c) The trial treatment(s) and the probability for random assignment to each treatment.

(d) The trial procedures to be followed, including all invasive procedures.

(e) The subject's responsibilities.

(f) Those aspects of the trial that are experimental.

(g) The reasonably foreseeable risks or inconveniences to the subject and, when applicable, to an embryo, fetus, or nursing infant.

(h) The reasonably expected benefits. When there is no intended clinical benefit to the subject, the subject should be made aware of this.

(i) The alternative procedure(s) or course(s) of treatment that may be available to the subject, and their important potential benefits and risks.

(j) The compensation and/or treatment available to the subject in the event of trial-related injury.

(k) The anticipated prorated payment, if any, to the subject for participating in the trial.

(l) The anticipated expenses, if any, to the subject for participating in the trial.

(m) That the subject's participation in the trial is voluntary and that the subject may refuse to participate or withdraw from the trial, at any time, without penalty or loss of benefits to which the subject is otherwise entitled.

(n) That the monitor(s), the auditor(s), the IRB/IEC, and the regulatory authority(ies) will be granted direct access to the subject's original medical records for verification of clinical trial procedures and/or data, without violating the confidentiality of the subject, to the extent permitted by the applicable laws and regulations and that, by signing a written informed consent form, the subject or the subject's legally acceptable representative is authorising such access.

(o) That records identifying the subject will be kept confidential and, to the extent permitted by the applicable laws and/or regulations, will not be made publicly available. If the results of the trial are published, the subject's identity will remain confidential.

(p) That the subject or the subject's legally acceptable representative will be informed in a timely manner if information becomes available that may be relevant to the subject's willingness to continue participation in the trial.

(q) The person(s) to contact for further information regarding the trial and the rights of trial subjects, and whom to contact in the event of trial-related injury.

(r) The foreseeable circumstances and/or reasons under which the subject's participation in the trial may be terminated.

(s) The expected duration of the subject's participation in the trial.

(t) The approximate number of subjects involved in the trial.

4.8.11 Prior to participation in the trial, the subject or the subject's legally acceptable representative should receive a copy of the signed and dated written informed consent form and any other written information provided to the subjects. During a subject's participation in the trial, the subject or the subject's legally acceptable representative should receive a copy of the signed and dated consent form updates and a copy of any amendments to the written information provided to subjects.

4.8.12 When a clinical trial (therapeutic or non-therapeutic) includes subjects who can only be enrolled in the trial with the consent of the subject's legally acceptable representative (e.g., minors, or patients with severe dementia), the subject should be informed about the trial to the extent compatible with the subject's understanding and, if capable, the subject should sign and personally date the written informed consent.

4.8.13 Except as described in 4.8.14, a non-therapeutic trial (i.e. a trial in which there is no anticipated direct clinical benefit to the subject), should be conducted in subjects who personally give consent and who sign and date the written informed consent form.

4.8.14 Non-therapeutic trials may be conducted in subjects with consent of a legally acceptable representative provided the following conditions are fulfilled:

(a) The objectives of the trial can not be met by means of a trial in subjects who can give informed consent personally.

(b) The foreseeable risks to the subjects are low.

(c) The negative impact on the subject's well-being is minimised and low.

(d) The trial is not prohibited by law.

(e) The approval/favourable opinion of the IRB/IEC is expressly sought on the inclusion of such subjects, and the written approval/ favourable opinion covers this aspect.

Such trials, unless an exception is justified, should be conducted in patients having a disease or condition for which the investigational product is intended. Subjects in these trials should be particularly closely monitored and should be withdrawn if they appear to be unduly distressed.

4.8.15 In emergency situations, when prior consent of the subject is not possible, the consent of the subject's legally acceptable representative, if present, should be requested. When prior consent of the subject is not possible, and

the subject's legally acceptable representative is not available, enrolment of the subject should require measures described in the protocol and/or elsewhere, with documented approval/favourable opinion by the IRB/IEC, to protect the rights, safety and well-being of the subject and to ensure compliance with applicable regulatory requirements. The subject or the subject's legally acceptable representative should be informed about the trial as soon as possible and consent to continue and other consent as appropriate (see 4.8.10) should be requested.

4.9 Records and Reports

4.9.1 The investigator should ensure the accuracy, completeness, legibility, and timeliness of the data reported to the sponsor in the CRFs and in all required reports.

4.9.2 Data reported on the CRF, that are derived from source documents, should be consistent with the source documents or the discrepancies should be explained.

4.9.3 Any change or correction to a CRF should be dated, initialed, and explained (if necessary) and should not obscure the original entry (i.e. an audit trail should be maintained); this applies to both written and electronic changes or corrections (see 5.18.4 (n)). Sponsors should provide guidance to investigators and/or the investigators' designated representatives on making such corrections. Sponsors should have written procedures to assure that changes or corrections in CRFs made by sponsor's designated representatives are documented, are necessary, and are endorsed by the investigator. The investigator should retain records of the changes and corrections.

4.9.4 The investigator/institution should maintain the trial documents as specified in Essential Documents for the Conduct of a Clinical Trial (see 8.) and as required by the applicable regulatory requirement(s). The investigator/institution should take measures to prevent accidental or premature destruction of these documents.

4.9.5 Essential documents should be retained until at least 2 years after the last approval of a marketing application in an ICH region and until there are no pending or contemplated marketing applications in an ICH region or at least 2 years have elapsed since the formal discontinuation of clinical development of the investigational product. These documents should be retained for a longer period however if required by the applicable regulatory requirements or by an agreement with the sponsor. It is the responsibility of the sponsor to inform the investigator/institution as to when these documents no longer need to be retained (see 5.5.12).

4.9.6 The financial aspects of the trial should be documented in an agreement between the sponsor and the investigator/institution.

4.9.7 Upon request of the monitor, auditor, IRB/IEC, or regulatory authority, the investigator/institution should make available for direct access all requested trial-related records.

4.10 Progress Reports

4.10.1 The investigator should submit written summaries of the trial status to the IRB/IEC annually, or more frequently, if requested by the IRB/IEC.

4.10.2 The investigator should promptly provide written reports to the sponsor, the IRB/IEC (see 3.3.8) and, where applicable, the institution on any changes significantly affecting the conduct of the trial, and/or increasing the risk to subjects.

4.11 Safety Reporting

4.11.1 All serious adverse events (SAEs) should be reported immediately to the sponsor except for those SAEs that the protocol or other document (e.g. Investigator's Brochure) identifies as not needing immediate reporting. The immediate reports should be followed promptly by detailed, written reports. The immediate and follow-up reports should identify subjects by unique code numbers assigned to the trial subjects rather than by the subjects' names, personal identification numbers, and/or addresses. The investigator should also comply with the applicable regulatory requirement(s) related to the reporting of unexpected serious adverse drug reactions to the regulatory authority(ies) and the IRB/IEC.

4.11.2 Adverse events and/or laboratory abnormalities identified in the protocol as critical to safety evaluations should be reported to the sponsor according to the reporting requirements and within the time periods specified by the sponsor in the protocol.

4.11.3 For reported deaths, the investigator should supply the sponsor and the IRB/IEC with any additional requested information (e.g. autopsy reports and terminal medical reports).

4.12 Premature Termination or Suspension of a Trial

If the trial is prematurely terminated or suspended for any reason, the investigator/institution should promptly inform the trial subjects, should assure appropriate therapy and follow-up for the subjects, and, where required by the applicable regulatory requirement(s), should inform the regulatory authority(ies). In addition:

4.12.1 If the investigator terminates or suspends a trial without prior agreement of the sponsor, the investigator should inform the institution where applicable, and the investigator/institution should promptly inform the sponsor and the IRB/IEC, and should provide the sponsor and the IRB/IEC a detailed written explanation of the termination or suspension.

4.12.2 If the sponsor terminates or suspends a trial (see 5.21), the investigator should promptly inform the institution where applicable and the investigator/institution should promptly inform the IRB/IEC and provide the IRB/IEC a detailed written explanation of the termination or suspension.

4.12.3 If the IRB/IEC terminates or suspends its approval/favourable opinion of a trial (see 3.1.2 and 3.3.9), the investigator should inform the institution

where applicable and the investigator/institution should promptly notify the sponsor and provide the sponsor with a detailed written explanation of the termination or suspension.

4.13 Final Report(s) by Investigator

Upon completion of the trial, the investigator, where applicable, should inform the institution; the investigator/institution should provide the IRB/IEC with a summary of the trial's outcome, and the regulatory authority(ies) with any reports required.

5. SPONSOR

5.1 Quality Assurance and Quality Control

5.1.1 The sponsor is responsible for implementing and maintaining quality assurance and quality control systems with written SOPs to ensure that trials are conducted and data are generated, documented (recorded), and reported in compliance with the protocol, GCP, and the applicable regulatory requirement(s).

5.1.2 The sponsor is responsible for securing agreement from all involved parties to ensure direct access (see 1.21) to all trial related sites, source data/documents, and reports for the purpose of monitoring and auditing by the sponsor, and inspection by domestic and foreign regulatory authorities.

5.1.3 Quality control should be applied to each stage of data handling to ensure that all data are reliable and have been processed correctly.

5.1.4 Agreements, made by the sponsor with the investigator/institution and any other parties involved with the clinical trial, should be in writing, as part of the protocol or in a separate agreement.

5.2 Contract Research Organization (CRO)

5.2.1 A sponsor may transfer any or all of the sponsor's trial-related duties and functions to a CRO, but the ultimate responsibility for the quality and integrity of the trial data always resides with the sponsor. The CRO should implement quality assurance and quality control.

5.2.2 Any trial-related duty and function that is transferred to and assumed by a CRO should be specified in writing.

5.2.3 Any trial-related duties and functions not specifically transferred to and assumed by a CRO are retained by the sponsor.

5.2.4 All references to a sponsor in this guideline also apply to a CRO to the extent that a CRO has assumed the trial related duties and functions of a sponsor.

5.3 Medical Expertise

The sponsor should designate appropriately qualified medical personnel who will be readily available to advise on trial related medical questions or problems. If necessary, outside consultant(s) may be appointed for this purpose.

5.4 Trial Design

5.4.1 The sponsor should utilize qualified individuals (e.g. biostatisticians, clinical pharmacologists, and physicians) as appropriate, throughout all stages of the trial process, from designing the protocol and CRFs and planning the analyses to analysing and preparing interim and final clinical trial reports.

5.4.2 For further guidance: Clinical Trial Protocol and Protocol Amendment(s) (see 6.), the ICH Guideline for Structure and Content of Clinical Study Reports, and other appropriate ICH guidance on trial design, protocol and conduct.

5.5 Trial Management, Data Handling, and Record Keeping

5.5.1 The sponsor should utilise appropriately qualified individuals to supervise the overall conduct of the trial, to handle the data, to verify the data, to conduct the statistical analyses, and to prepare the trial reports.

5.5.2 The sponsor may consider establishing an independent data-monitoring committee (IDMC) to assess the progress of a clinical trial, including the safety data and the critical efficacy endpoints at intervals, and to recommend to the sponsor whether to continue, modify, or stop a trial. The IDMC should have written operating procedures and maintain written records of all its meetings.

5.5.3 When using electronic trial data handling and/or remote electronic trial data systems, the sponsor should:

(a) Ensure and document that the electronic data processing system(s) conforms to the sponsor's established requirements for completeness, accuracy, reliability, and consistent intended performance (i.e. validation).

(b) Maintains SOPs for using these systems.

(c) Ensure that the systems are designed to permit data changes in such a way that the data changes are documented and that there is no deletion of entered data (i.e. maintain an audit trail, data trail, edit trail).

(d) Maintain a security system that prevents unauthorized access to the data.

(e) Maintain a list of the individuals who are authorized to make data changes (see 4.1.5 and 4.9.3).

(f) Maintain adequate backup of the data.

(g) Safeguard the blinding, if any (e.g. maintain the blinding during data entry and processing).

5.5.4 If data are transformed during processing, it should always be possible to compare the original data and observations with the processed data.

5.5.5 The sponsor should use an unambiguous subject identification code (see 1.58) that allows identification of all the data reported for each subject.

5.5.6 The sponsor, or other owners of the data, should retain all of the sponsor-specific essential documents pertaining to the trial (see 8. Essential Documents for the Conduct of a Clinical Trial).

5.5.7 The sponsor should retain all sponsor-specific essential documents in conformance with the applicable regulatory requirement(s) of the country(ies) where the product is approved, and/or where the sponsor intends to apply for approval(s).

5.5.8 If the sponsor discontinues the clinical development of an investigational product (i.e. for any or all indications, routes of administration, or dosage forms), the sponsor should maintain all sponsor-specific essential documents for at least 2 years after formal discontinuation or in conformance with the applicable regulatory requirement(s).

5.5.9 If the sponsor discontinues the clinical development of an investigational product, the sponsor should notify all the trial investigators/institutions and all the regulatory authorities.

5.5.10 Any transfer of ownership of the data should be reported to the appropriate authority(ies), as required by the applicable regulatory requirement(s).

5.5.11 The sponsor specific essential documents should be retained until at least 2 years after the last approval of a marketing application in an ICH region and until there are no pending or contemplated marketing applications in an ICH region or at least 2 years have elapsed since the formal discontinuation of clinical development of the investigational product. These documents should be retained for a longer period however if required by the applicable regulatory requirement(s) or if needed by the sponsor.

5.5.12 The sponsor should inform the investigator(s)/institution(s) in writing of the need for record retention and should notify the investigator(s)/institution(s) in writing when the trial related records are no longer needed.

5.6 Investigator Selection

5.6.1 The sponsor is responsible for selecting the investigator(s)/institution(s). Each investigator should be qualified by training and experience and should have adequate resources (see 4.1, 4.2) to properly conduct the trial for which the investigator is selected. If organization of a coordinating committee and/or selection of coordinating investigator(s) are to be utilised in multicentre trials, their organisation and/or selection are the sponsor's responsibility.

5.6.2 Before entering an agreement with an investigator/institution to conduct a trial, the sponsor should provide the investigator(s)/institution(s) with the protocol and an up-to-date Investigator's Brochure, and should provide sufficient time for the investigator/institution to review the protocol and the information provided.

5.6.3 The sponsor should obtain the investigator's/institution's agreement:

(a) to conduct the trial in compliance with GCP, with the applicable regulatory requirement(s) (see 4.1.3), and with the protocol agreed to by the sponsor and given approval/favourable opinion by the IRB/IEC (see 4.5.1);

(b) to comply with procedures for data recording/reporting;

(c) to permit monitoring, auditing and inspection (see 4.1.4); and

(d) to retain the trial related essential documents until the sponsor informs the investigator/institution these documents are no longer needed (see 4.9.4 and 5.5.12).

The sponsor and the investigator/institution should sign the protocol, or an alternative document, to confirm this agreement.

5.7 Allocation of Responsibilities

Prior to initiating a trial, the sponsor should define, establish, and allocate all trial-related duties and functions.

5.8 Compensation to Subjects and Investigators

5.8.1 If required by the applicable regulatory requirement(s), the sponsor should provide insurance or should indemnify (legal and financial coverage) the investigator/the institution against claims arising from the trial, except for claims that arise from malpractice and/or negligence.

5.8.2 The sponsor's policies and procedures should address the costs of treatment of trial subjects in the event of trial-related injuries in accordance with the applicable regulatory requirement(s).

5.8.3 When trial subjects receive compensation, the method and manner of compensation should comply with applicable regulatory requirement(s).

5.9 Financing

The financial aspects of the trial should be documented in an agreement between the sponsor and the investigator/institution.

5.10 Notification/Submission to Regulatory Authority(ies)

Before initiating the clinical trial(s), the sponsor (or the sponsor and the investigator, if required by the applicable regulatory requirement(s)) should submit any required application(s) to the appropriate authority(ies) for review, acceptance, and/or permission (as required by the applicable regulatory requirement(s)) to begin the trial(s). Any notification/submission should be dated and contain sufficient information to identify the protocol.

5.11 Confirmation of Review by IRB/IEC

5.11.1 The sponsor should obtain from the investigator/institution:

(a) The name and address of the investigator's/institution's IRB/IEC.

(b) A statement obtained from the IRB/IEC that it is organized and operates according to GCP and the applicable laws and regulations.

(c) Documented IRB/IEC approval/favourable opinion and, if requested by the sponsor, a current copy of protocol, written informed consent form(s) and any other written information to be provided to subjects, subject recruiting procedures, and documents related to payments and compensation available to the subjects, and any other documents that the IRB/IEC may have requested.

5.11.2 If the IRB/IEC conditions its approval/favourable opinion upon change(s) in any aspect of the trial, such as modification(s) of the protocol, written informed consent form and any other written information to be provided to subjects, and/or other procedures, the sponsor should obtain from the investigator/institution a copy of the modification(s) made and the date approval/favourable opinion was given by the IRB/IEC.

5.11.3 The sponsor should obtain from the investigator/institution documentation and dates of any IRB/IEC reapprovals/re-evaluations with favourable opinion, and of any withdrawals or suspensions of approval/favourable opinion.

5.12 Information on Investigational Product(s)

5.12.1 When planning trials, the sponsor should ensure that sufficient safety and efficacy data from non-clinical studies and/or clinical trials are available to support human exposure by the route, at the dosages, for the duration, and in the trial population to be studied.

5.12.2 The sponsor should update the Investigator's Brochure as significant new information becomes available (see 7. Investigator's Brochure).

5.13 Manufacturing, Packaging, Labelling, and Coding Investigational Product(s)

5.13.1 The sponsor should ensure that the investigational product(s) (including active comparator(s) and placebo, if applicable) is characterized as appropriate to the stage of development of the product(s), is manufactured in accordance with any applicable GMP, and is coded and labelled in a manner that protects the blinding, if applicable. In addition, the labelling should comply with applicable regulatory requirement(s).

5.13.2 The sponsor should determine, for the investigational product(s), acceptable storage temperatures, storage conditions (e.g. protection from light), storage times, reconstitution fluids and procedures, and devices for product infusion, if any. The sponsor should inform all involved parties (e.g. monitors, investigators, pharmacists, storage managers) of these determinations.

5.13.3 The investigational product(s) should be packaged to prevent contamination and unacceptable deterioration during transport and storage.

5.13.4 In blinded trials, the coding system for the investigational product(s) should include a mechanism that permits rapid identification of the

product(s) in case of a medical emergency, but does not permit undetectable breaks of the blinding.

5.13.5 If significant formulation changes are made in the investigational or comparator product(s) during the course of clinical development, the results of any additional studies of the formulated product(s) (e.g. stability, dissolution rate, bioavailability) needed to assess whether these changes would significantly alter the pharmacokinetic profile of the product should be available prior to the use of the new formulation in clinical trials.

5.14 Supplying and Handling Investigational Product(s)

5.14.1 The sponsor is responsible for supplying the investigator(s)/institution(s) with the investigational product(s).

5.14.2 The sponsor should not supply an investigator/institution with the investigational product(s) until the sponsor obtains all required documentation (e.g. approval/favourable opinion from IRB/IEC and regulatory authority(ies)).

5.14.3 The sponsor should ensure that written procedures include instructions that the investigator/institution should follow for the handling and storage of investigational product(s) for the trial and documentation thereof. The procedures should address adequate and safe receipt, handling, storage, dispensing, retrieval of unused product from subjects, and return of unused investigational product(s) to the sponsor (or alternative disposition if authorised by the sponsor and in compliance with the applicable regulatory requirement(s)).

5.14.4 The sponsor should:

(a) Ensure timely delivery of investigational product(s) to the investigator(s).

(b) Maintain records that document shipment, receipt, disposition, return, and destruction of the investigational product(s) (see 8. Essential Documents for the Conduct of a Clinical Trial).

(c) Maintain a system for retrieving investigational products and documenting this retrieval (e.g. for deficient product recall, reclaim after trial completion, expired product reclaim).

(d) Maintain a system for the disposition of unused investigational product(s) and for the documentation of this disposition.

5.14.5 The sponsor should:

(a) Take steps to ensure that the investigational product(s) are stable over the period of use.

(b) Maintain sufficient quantities of the investigational product(s) used in the trials to reconfirm specifications, should this become necessary, and maintain records of batch sample analyses and characteristics. To the extent stability permits, samples should be retained either until the analyses of the trial data are complete or as required by the

applicable regulatory requirement(s), whichever represents the longer retention period.

5.15 Record Access

5.15.1 The sponsor should ensure that it is specified in the protocol or other written agreement that the investigator(s)/institution(s) provide direct access to source data/documents for trial-related monitoring, audits, IRB/IEC review, and regulatory inspection.

5.15.2 The sponsor should verify that each subject has consented, in writing, to direct access to his/her original medical records for trial-related monitoring, audit, IRB/IEC review, and regulatory inspection.

5.16 Safety Information

5.16.1 The sponsor is responsible for the ongoing safety evaluation of the investigational product(s).

5.16.2 The sponsor should promptly notify all concerned investigator(s)/institution(s) and the regulatory authority(ies) of findings that could affect adversely the safety of subjects, impact the conduct of the trial, or alter the IRB/IEC's approval/favourable opinion to continue the trial.

5.17 Adverse Drug Reaction Reporting

5.17.1 The sponsor should expedite the reporting to all concerned investigator(s)/institutions(s), to the IRB(s)/IEC(s), where required, and to the regulatory authority(ies) of all adverse drug reactions (ADRs) that are both serious and unexpected.

5.17.2 Such expedited reports should comply with the applicable regulatory requirement(s) and with the ICH Guideline for Clinical Safety Data Management: Definitions and Standards for Expedited Reporting.

5.17.3 The sponsor should submit to the regulatory authority(ies) all safety updates and periodic reports, as required by applicable regulatory requirement(s).

5.18 Monitoring

5.18.1 *Purpose*

The purposes of trial monitoring are to verify that:

(a) The rights and well-being of human subjects are protected.

(b) The reported trial data are accurate, complete, and verifiable from source documents.

(c) The conduct of the trial is in compliance with the currently approved protocol/amendment(s), with GCP, and with the applicable regulatory requirement(s).

5.18.2 *Selection and Qualifications of Monitors*

(a) Monitors should be appointed by the sponsor.

(b) Monitors should be appropriately trained, and should have the scientific and/or clinical knowledge needed to monitor the trial adequately. A monitor's qualifications should be documented.

(c) Monitors should be thoroughly familiar with the investigational product(s), the protocol, written informed consent form and any other written information to be provided to subjects, the sponsor's SOPs, GCP, and the applicable regulatory requirement(s).

5.18.3 *Extent and Nature of Monitoring*

The sponsor should ensure that the trials are adequately monitored. The sponsor should determine the appropriate extent and nature of monitoring. The determination of the extent and nature of monitoring should be based on considerations such as the objective, purpose, design, complexity, blinding, size, and endpoints of the trial. In general there is a need for on-site monitoring, before, during, and after the trial; however in exceptional circumstances the sponsor may determine that central monitoring in conjunction with procedures such as investigators' training and meetings, and extensive written guidance can assure appropriate conduct of the trial in accordance with GCP. Statistically controlled sampling may be an acceptable method for selecting the data to be verified.

5.18.4 *Monitor's Responsibilities*

The monitor(s) in accordance with the sponsor's requirements should ensure that the trial is conducted and documented properly by carrying out the following activities when relevant and necessary to the trial and the trial site:

(a) Acting as the main line of communication between the sponsor and the investigator.

(b) Verifying that the investigator has adequate qualifications and resources (see 4.1, 4.2, 5.6) and remain adequate throughout the trial period, that facilities, including laboratories, equipment, and staff, are adequate to safely and properly conduct the trial and remain adequate throughout the trial period.

(c) Verifying, for the investigational product(s):

(i) That storage times and conditions are acceptable, and that supplies are sufficient throughout the trial.

(ii) That the investigational product(s) are supplied only to subjects who are eligible to receive it and at the protocol specified dose(s).

(iii) That subjects are provided with necessary instruction on properly using, handling, storing, and returning the investigational product(s).

(iv) That the receipt, use, and return of the investigational product(s) at the trial sites are controlled and documented adequately.

(v) That the disposition of unused investigational product(s) at the trial sites complies with applicable regulatory requirement(s) and is in accordance with the sponsor.

(d) Verifying that the investigator follows the approved protocol and all approved amendment(s), if any.

(e) Verifying that written informed consent was obtained before each subject's participation in the trial.

(f) Ensuring that the investigator receives the current Investigator's Brochure, all documents, and all trial supplies needed to conduct the trial properly and to comply with the applicable regulatory requirement(s).

(g) Ensuring that the investigator and the investigator's trial staff are adequately informed about the trial.

(h) Verifying that the investigator and the investigator's trial staff are performing the specified trial functions, in accordance with the protocol and any other written agreement between the sponsor and the investigator/institution, and have not delegated these functions to unauthorised individuals.

(i) Verifying that the investigator is enroling only eligible subjects.

(j) Reporting the subject recruitment rate.

(k) Verifying that source documents and other trial records are accurate, complete, kept up-to-date and maintained.

(l) Verifying that the investigator provides all the required reports, notifications, applications, and submissions, and that these documents are accurate, complete, timely, legible, dated, and identify the trial.

(m) Checking the accuracy and completeness of the CRF entries, source documents and other trial-related records against each other. The monitor specifically should verify that:

(i) The data required by the protocol are reported accurately on the CRFs and are consistent with the source documents.

(ii) Any dose and/or therapy modifications are well documented for each of the trial subjects.

(iii) Adverse events, concomitant medications and intercurrent illnesses are reported in accordance with the protocol on the CRFs.

(iv) Visits that the subjects fail to make, tests that are not conducted, and examinations that are not performed are clearly reported as such on the CRFs.

(v) All withdrawals and dropouts of enrolled subjects from the trial are reported and explained on the CRFs.

(n) Informing the investigator of any CRF entry error, omission, or illegibility. The monitor should ensure that appropriate corrections, addi-

tions, or deletions are made, dated, explained (if necessary), and initialled by the investigator or by a member of the investigator's trial staff who is authorized to initial CRF changes for the investigator. This authorization should be documented.

(o) Determining whether all adverse events (AEs) are appropriately reported within the time periods required by GCP, the protocol, the IRB/IEC, the sponsor, and the applicable regulatory requirement(s).

(p) Determining whether the investigator is maintaining the essential documents (see 8. Essential Documents for the Conduct of a Clinical Trial).

(q) Communicating deviations from the protocol, SOPs, GCP, and the applicable regulatory requirements to the investigator and taking appropriate action designed to prevent recurrence of the detected deviations.

5.18.5 *Monitoring Procedures*

The monitor(s) should follow the sponsor's established written SOPs as well as those procedures that are specified by the sponsor for monitoring a specific trial.

5.18.6 *Monitoring Report*

(a) The monitor should submit a written report to the sponsor after each trial-site visit or trial-related communication.

(b) Reports should include the date, site, name of the monitor, and name of the investigator or other individual(s) contacted.

(c) Reports should include a summary of what the monitor reviewed and the monitor's statements concerning the significant findings/facts, deviations and deficiencies, conclusions, actions taken or to be taken and/or actions recommended to secure compliance.

(d) The review and follow-up of the monitoring report with the sponsor should be documented by the sponsor's designated representative.

5.19 Audit

If or when sponsors perform audits, as part of implementing quality assurance, they should consider:

5.19.1 *Purpose*

The purpose of a sponsor's audit, which is independent of and separate from routine monitoring or quality control functions, should be to evaluate trial conduct and compliance with the protocol, SOPs, GCP, and the applicable regulatory requirements.

5.19.2 *Selection and Qualification of Auditors*

(a) The sponsor should appoint individuals, who are independent of the clinical trials/systems, to conduct audits.

(b) The sponsor should ensure that the auditors are qualified by training and experience to conduct audits properly. An auditor's qualifications should be documented.

5.19.3 *Auditing Procedures*

(a) The sponsor should ensure that the auditing of clinical trials/systems is conducted in accordance with the sponsor's written procedures on what to audit, how to audit, the frequency of audits, and the form and content of audit reports.

(b) The sponsor's audit plan and procedures for a trial audit should be guided by the importance of the trial to submissions to regulatory authorities, the number of subjects in the trial, the type and complexity of the trial, the level of risks to the trial subjects, and any identified problem(s).

(c) The observations and findings of the auditor(s) should be documented.

(d) To preserve the independence and value of the audit function, the regulatory authority(ies) should not routinely request the audit reports. Regulatory authority(ies) may seek access to an audit report on a case by case basis when evidence of serious GCP non-compliance exists, or in the course of legal proceedings.

(e) When required by applicable law or regulation, the sponsor should provide an audit certificate.

5.20 Non-compliance

5.20.1 Non-compliance with the protocol, SOPs, GCP, and/or applicable regulatory requirement(s) by an investigator/institution, or by member(s) of the sponsor's staff should lead to prompt action by the sponsor to secure compliance.

5.20.2 If the monitoring and/or auditing identifies serious and/or persistent non-compliance on the part of an investigator/institution, the sponsor should terminate the investigator's/institution's participation in the trial. When an investigator's/institution's participation is terminated because of non-compliance, the sponsor should notify promptly the regulatory authority(ies).

5.21 Premature Termination or Suspension of a Trial

If a trial is prematurely terminated or suspended, the sponsor should promptly inform the investigators/institutions, and the regulatory authority(ies) of the termination or suspension and the reason(s) for the termination or suspension. The IRB/IEC should also be informed promptly and provided the reason(s) for the termination or suspension by the sponsor or by the investigator/institution, as specified by the applicable regulatory requirement(s).

5.22 Clinical Trial/Study Reports

Whether the trial is completed or prematurely terminated, the sponsor should ensure that the clinical trial reports are prepared and provided to the regulatory agency(ies) as required by the applicable regulatory requirement(s). The sponsor should also ensure that the clinical trial reports in marketing applications meet the standards of the ICH Guideline for Structure and Content of Clinical Study Reports. (NOTE: The ICH Guideline for Structure and Content of Clinical Study Reports specifies that abbreviated study reports may be acceptable in certain cases.)

5.23 Multicentre Trials

For multicentre trials, the sponsor should ensure that:

5.23.1 All investigators conduct the trial in strict compliance with the protocol agreed to by the sponsor and, if required, by the regulatory authority(ies), and given approval/favourable opinion by the IRB/IEC.

5.23.2 The CRFs are designed to capture the required data at all multicentre trial sites. For those investigators who are collecting additional data, supplemental CRFs should also be provided that are designed to capture the additional data.

5.23.3 The responsibilities of coordinating investigator(s) and the other participating investigators are documented prior to the start of the trial.

5.23.4 All investigators are given instructions on following the protocol, on complying with a uniform set of standards for the assessment of clinical and laboratory findings, and on completing the CRFs.

5.23.5 Communication between investigators is facilitated.

6. CLINICAL TRIAL PROTOCOL AND PROTOCOL AMENDMENT(S)

The contents of a trial protocol should generally include the following topics. However, site specific information may be provided on separate protocol page(s), or addressed in a separate agreement, and some of the information listed below may be contained in other protocol referenced documents, such as an Investigator's Brochure.

6.1 General Information

6.1.1 Protocol title, protocol identifying number, and date. Any amendment(s) should also bear the amendment number(s) and date(s).

6.1.2 Name and address of the sponsor and monitor (if other than the sponsor).

6.1.3 Name and title of the person(s) authorized to sign the protocol and the protocol amendment(s) for the sponsor.

6.1.4 Name, title, address, and telephone number(s) of the sponsor's medical expert (or dentist when appropriate) for the trial.

6.1.5 Name and title of the investigator(s) who is (are) responsible for conducting the trial, and the address and telephone number(s) of the trial site(s).

6.1.6 Name, title, address, and telephone number(s) of the qualified physician (or dentist, if applicable), who is responsible for all trial-site related medical (or dental) decisions (if other than investigator).

6.1.7 Name(s) and address(es) of the clinical laboratory(ies) and other medical and/or technical department(s) and/or institutions involved in the trial.

6.2 Background Information

6.2.1 Name and description of the investigational product(s).

6.2.2 A summary of findings from non-clinical studies that potentially have clinical significance and from clinical trials that are relevant to the trial.

6.2.3 Summary of the known and potential risks and benefits, if any, to human subjects.

6.2.4 Description of and justification for the route of administration, dosage, dosage regimen, and treatment period(s).

6.2.5 A statement that the trial will be conducted in compliance with the protocol, GCP and the applicable regulatory requirement(s).

6.2.6 Description of the population to be studied.

6.2.7 References to literature and data that are relevant to the trial, and that provide background for the trial.

6.3 Trial Objectives and Purpose

A detailed description of the objectives and the purpose of the trial.

6.4 Trial Design

The scientific integrity of the trial and the credibility of the data from the trial depend substantially on the trial design. A description of the trial design, should include:

6.4.1 A specific statement of the primary endpoints and the secondary endpoints, if any, to be measured during the trial.

6.4.2 A description of the type/design of trial to be conducted (e.g. double-blind, placebo-controlled, parallel design) and a schematic diagram of trial design, procedures and stages.

6.4.3 A description of the measures taken to minimise/avoid bias, including:

(a) Randomization.

(b) Blinding.

6.4.4 A description of the trial treatment(s) and the dosage and dosage regimen of the investigational product(s). Also include a description of the dosage form, packaging, and labelling of the investigational product(s).

6.4.5 The expected duration of subject participation, and a description of the sequence and duration of all trial periods, including follow-up, if any.

6.4.6 A description of the "stopping rules" or "discontinuation criteria" for individual subjects, parts of trial and entire trial.

6.4.7 Accountability procedures for the investigational product(s), including the placebo(s) and comparator(s), if any.

6.4.8 Maintenance of trial treatment randomization codes and procedures for breaking codes.

6.4.9 The identification of any data to be recorded directly on the CRFs (i.e. no prior written or electronic record of data), and to be considered to be source data.

6.5 Selection and Withdrawal of Subjects

6.5.1 Subject inclusion criteria.

6.5.2 Subject exclusion criteria.

6.5.3 Subject withdrawal criteria (i.e. terminating investigational product treatment/trial treatment) and procedures specifying:

(a) When and how to withdraw subjects from the trial/ investigational product treatment.

(b) The type and timing of the data to be collected for withdrawn subjects.

(c) Whether and how subjects are to be replaced.

(d) The follow-up for subjects withdrawn from investigational product treatment/trial treatment.

6.6 Treatment of Subjects

6.6.1 The treatment(s) to be administered, including the name(s) of all the product(s), the dose(s), the dosing schedule(s), the route/mode(s) of administration, and the treatment period(s), including the follow-up period(s) for subjects for each investigational product treatment/trial treatment group/arm of the trial.

6.6.2 Medication(s)/treatment(s) permitted (including rescue medication) and not permitted before and/or during the trial.

6.6.3 Procedures for monitoring subject compliance.

6.7 Assessment of Efficacy

6.7.1 Specification of the efficacy parameters.

6.7.2 Methods and timing for assessing, recording, and analysing of efficacy parameters.

6.8 Assessment of Safety

6.8.1 Specification of safety parameters.

6.8.2 The methods and timing for assessing, recording, and analysing safety parameters.

6.8.3 Procedures for eliciting reports of and for recording and reporting adverse event and intercurrent illnesses.

6.8.4 The type and duration of the follow-up of subjects after adverse events.

6.9 Statistics

6.9.1 A description of the statistical methods to be employed, including timing of any planned interim analysis(ses).

6.9.2 The number of subjects planned to be enrolled. In multicentre trials, the numbers of enrolled subjects projected for each trial site should be specified. Reason for choice of sample size, including reflections on (or calculations of) the power of the trial and clinical justification.

6.9.3 The level of significance to be used.

6.9.4 Criteria for the termination of the trial.

6.9.5 Procedure for accounting for missing, unused, and spurious data.

6.9.6 Procedures for reporting any deviation(s) from the original statistical plan (any deviation(s) from the original statistical plan should be described and justified in protocol and/or in the final report, as appropriate).

6.9.7 The selection of subjects to be included in the analyses (e.g. all randomised subjects, all dosed subjects, all eligible subjects, evaluable subjects).

6.10 Direct Access to Source Data/Documents

The sponsor should ensure that it is specified in the protocol or other written agreement that the investigator(s)/institution(s) will permit trial-related monitoring, audits, IRB/IEC review, and regulatory inspection(s), providing direct access to source data/documents.

6.11 Quality Control and Quality Assurance

6.12 Ethics

Description of ethical considerations relating to the trial.

6.13 Data Handling and Record Keeping

6.14 Financing and Insurance

Financing and insurance if not addressed in a separate agreement.

6.15 Publication Policy

Publication policy, if not addressed in a separate agreement.

6.16 Supplements

(NOTE: Since the protocol and the clinical trial/study report are closely related, further relevant information can be found in the ICH Guideline for Structure and Content of Clinical Study Reports.)

7. INVESTIGATOR'S BROCHURE

7.1 Introduction

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 subjects. Its purpose is to provide the investigators and others involved in the trial with the information to facilitate their understanding of the rationale for, and their compliance with, many key features of the protocol, such as the dose, dose frequency/interval, methods of administration: and safety monitoring procedures. The IB also provides insight to support the clinical management of the study subjects during the course of the clinical trial. The information should be presented in a concise, simple, objective, balanced, and non-promotional form that enables a clinician, or potential investigator, to understand it and make his/her own unbiased risk-benefit assessment of the appropriateness of the proposed trial. For this reason, a medically qualified person should generally participate in the editing of an IB, but the contents of the IB should be approved by the disciplines that generated the described data.

This guideline delineates the minimum information that should be included in an IB and provides suggestions for its layout. It is expected that the type and extent of information available will vary with the stage of development of the investigational product. If the investigational product is marketed and its pharmacology is widely understood by medical practitioners, an extensive IB may not be necessary. Where permitted by regulatory authorities, a basic product information brochure, package leaflet, or labelling may be an appropriate alternative, provided that it includes current, comprehensive, and detailed information on all aspects of the investigational product that might be of importance to the investigator. If a marketed product is being studied for a new use (i.e. a new indication), an IB specific to that new use should be prepared. The IB should be reviewed at least annually and revised as necessary in compliance with a sponsor's written procedures. More frequent revision may be appropriate depending on the stage of development and the generation of relevant new information. However, in accordance with Good Clinical Practice, relevant new information may be so important that it should be communicated to the investigators, and possibly to the Institutional Review Boards (IRBs)/Independent Ethics Committees (IECs) and/or regulatory authorities before it is included in a revised IB.

Generally, the sponsor is responsible for ensuring that an up-to-date IB is made available to the investigator(s) and the investigators are responsible for providing the up-to-date IB to the responsible IRBs/IECs. In the case of an investigator sponsored trial, the sponsor-investigator should determine whether a brochure is available from the commercial manufacturer. If the investigational product is provided by the sponsor-investigator, then he or she should provide the necessary information to the trial personnel. In cases where preparation of a formal IB is impractical, the sponsor-investigator should provide, as a substitute, an expanded background information section in the trial protocol that contains the minimum current information described in this guideline.

7.2 General Considerations

The IB should include:

7.2.1 *Title Page*

This should provide the sponsor's name, the identity of each investigational product (i.e. research number, chemical or approved generic name, and trade name(s) where legally permissible and desired by the sponsor), and the release date. It is also suggested that an edition number, and a reference to the number and date of the edition it supersedes, be provided. An example is given in Appendix 1.

7.2.2 *Confidentiality Statement*

The sponsor may wish to include a statement instructing the investigator/recipients to treat the IB as a confidential document for the sole information and use of the investigator's team and the IRB/IEC.

7.3 Contents of the Investigator's Brochure

The IB should contain the following sections, each with literature references where appropriate:

7.3.1 *Table of Contents*

An example of the Table of Contents is given in Appendix 2

7.3.2 *Summary*

A brief summary (preferably not exceeding two pages) should be given, highlighting the significant physical, chemical, pharmaceutical, pharmacological, toxicological, pharmacokinetic, metabolic, and clinical information available that is relevant to the stage of clinical development of the investigational product.

7.3.3 *Introduction*

A brief introductory statement should be provided that contains the chemical name (and generic and trade name(s) when approved) of the investigational product(s), all active ingredients, the investigational product(s) pharmacological class and its expected position within this class (e.g. advantages), the rationale for performing research with the investigational product(s), and the anticipated prophylactic, therapeutic, or diagnostic indication(s). Finally, the introductory statement should provide the general approach to be followed in evaluating the investigational product.

7.3.4 *Physical, Chemical, and Pharmaceutical Properties and Formulation*

A description should be provided of the investigational product substance(s) (including the chemical and/or structural formula(e)), and a brief summary should be given of the relevant physical, chemical, and pharmaceutical properties.

To permit appropriate safety measures to be taken in the course of the trial, a description of the formulation(s) to be used, including excipients, should be provided and justified if clinically relevant. Instructions for the storage and handling of the dosage form(s) should also be given.

Any structural similarities to other known compounds should be mentioned.

7.3.5 *Non-clinical Studies*

Introduction

The results of all relevant non-clinical pharmacology, toxicology, pharmacokinetic, and investigational product metabolism studies should be provided in summary form. This summary should address the methodology used, the results, and a discussion of the relevance of the findings to the investigated therapeutic and the possible unfavourable and unintended effects in humans.

The information provided may include the following, as appropriate, if known/available:

- Species tested
- Number and sex of animals in each group
- Unit dose (e.g., milligram/kilogram (mg/kg))
- Dose interval
- Route of administration
- Duration of dosing
- Information on systemic distribution
- Duration of post-exposure follow-up
- Results, including the following aspects:
  - Nature and frequency of pharmacological or toxic effects
  - Severity or intensity of pharmacological or toxic effects
  - Time to onset of effects
  - Reversibility of effects
  - Duration of effects
  - Dose response

Tabular format/listings should be used whenever possible to enhance the clarity of the presentation.

The following sections should discuss the most important findings from the studies, including the dose response of observed effects, the relevance to humans, and any aspects to be studied in humans. If applicable, the effective and non-toxic dose findings in the same animal species should be compared (i.e. the therapeutic index should be discussed). The relevance of this information to the proposed human dosing should be addressed. Whenever possible, comparisons should be made in terms of blood/tissue levels rather than on a mg/kg basis.

(a) *Non-clinical Pharmacology*

A summary of the pharmacological aspects of the investigational product and, where appropriate, its significant metabolites studied in animals, should be included. Such a summary should incorporate studies that assess potential therapeutic activity (e.g. efficacy models, receptor binding, and specificity) as well as those that assess

safety (e.g. special studies to assess pharmacological actions other than the intended therapeutic effect(s)).

(b) *Pharmacokinetics and Product Metabolism in Animals*

A summary of the pharmacokinetics and biological transformation and disposition of the investigational product in all species studied should be given. The discussion of the findings should address the absorption and the local and systemic bioavailability of the investigational product and its metabolites, and their relationship to the pharmacological and toxicological findings in animal species.

(c) *Toxicology*

A summary of the toxicological effects found in relevant studies conducted in different animal species should be described under the following headings where appropriate:

- Single dose
- Repeated dose
- Carcinogenicity
- Special studies (e.g. irritancy and sensitisation)
- Reproductive toxicity
- Genotoxicity (mutagenicity)

7.3.6 *Effects in Humans*

Introduction

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. Where possible, a summary of each completed clinical trial should be provided. Information should also be provided regarding results of any use of the investigational product(s) other than from in clinical trials, such as from experience during marketing.

(a) *Pharmacokinetics and Product Metabolism in Humans*

- A summary of information on the pharmacokinetics of the investigational product(s) should be presented, including the following, if available:
- Pharmacokinetics (including metabolism, as appropriate, and absorption, plasma protein binding, distribution, and elimination).
- Bioavailability of the investigational product (absolute, where possible, and/or relative) using a reference dosage form.
- Population subgroups (e.g. gender, age, and impaired organ function).
- Interactions (e.g. product-product interactions and effects of food).

– Other pharmacokinetic data (e.g. results of population studies performed within clinical trial(s).

(b) *Safety and Efficacy*

A summary of information should be provided about the investigational product's/products' (including metabolites, where appropriate) safety, pharmacodynamics, efficacy, and dose response that were obtained from preceding trials in humans (healthy volunteers and/or patients). The implications of this information should be discussed. In cases where a number of clinical trials have been completed, the use of summaries of safety and efficacy across multiple trials by indications in subgroups may provide a clear presentation of the data. Tabular summaries of adverse drug reactions for all the clinical trials (including those for all the studied indications) would be useful. Important differences in adverse drug reaction patterns/incidences across indications or subgroups should be discussed.

The IB should provide a description of the possible risks and adverse drug reactions to be anticipated on the basis of prior experiences with the product under investigation and with related products. A description should also be provided of the precautions or special monitoring to be done as part of the investigational use of the product(s).

(c) *Marketing Experience*

The IB should identify countries where the investigational product has been marketed or approved. Any significant information arising from the marketed use should be summarized (e.g. formulations, dosages, routes of administration, and adverse product reactions). The IB should also identify all the countries where the investigational product did not receive approval/registration for marketing or was withdrawn from marketing/registration.

7.3.7 *Summary of Data and Guidance for the Investigator*

This section should provide an overall discussion of the non-clinical and clinical data, and should summarize the information from various sources on different aspects of the investigational product(s), wherever possible. In this way, the investigator can be provided with the most informative interpretation of the available data and with an assessment of the implications of the information for future clinical trials.

Where appropriate, the published reports on related products should be discussed. This could help the investigator to anticipate adverse drug reactions or other problems in clinical trials.

The overall aim of this section is to provide the investigator with a clear understanding of the possible risks and adverse reactions, and of the specific tests, observations, and precautions that may be needed for a clinical trial. This understanding should be based on the available physical, chemical, pharmaceutical, pharmacological, toxicological, and clinical information on the in-

vestigational product(s). Guidance should also be provided to the clinical investigator on the recognition and treatment of possible overdose and adverse drug reactions that is based on previous human experience and on the pharmacology of the investigational product.

7.4 Appendix 1

TITLE PAGE *(Example)*

SPONSOR'S NAME

Product:
Research Number:
Name(s): Chemical, Generic (if approved)
Trade Name(s) (if legally permissible and desired by the sponsor)

INVESTIGATOR'S BROCHURE

Edition Number:
Release Date:

Replaces Previous Edition Number:
Date:

7.5 Appendix 2

TABLE OF CONTENTS OF INVESTIGATOR'S BROCHURE *(Example)*

NB: References on 1. Publications
2. Reports

These references should be found at the end of each chapter
Appendices (if any)

8. ESSENTIAL DOCUMENTS FOR THE CONDUCT OF A CLINICAL TRIAL

8.1 Introduction

Essential Documents are those documents which individually and collectively permit evaluation of the conduct of a trial and the quality of the data produced. These documents serve to demonstrate the compliance of the investigator, sponsor and monitor with the standards of Good Clinical Practice and with all applicable regulatory requirements.

Essential Documents also serve a number of other important purposes. Filing essential documents at the investigator/institution and sponsor sites in a timely manner can greatly assist in the successful management of a trial by the investigator, sponsor and monitor. These documents are also the ones which are usually audited by the sponsor's independent audit function and inspected by the regulatory authority (ies) as part of the process to confirm the validity of the trial conduct and the integrity of data collected.

The minimum list of essential documents which has been developed follows. The various documents are grouped in three sections according to the stage of the trial during which they will normally be generated: 1) before the clinical phase of the trial commences, 2) during the clinical conduct of the trial, and 3) after completion or termination of the trial. A description is given of the purpose of each document, and whether it should be filed in either the investigator/institution or sponsor files, or both. It is acceptable to combine some of the documents, provided the individual elements are readily identifiable.

Trial master files should be established at the beginning of the trial, both at the investigator/institution's site and at the sponsor's office. A final close-out of a trial can only be done when the monitor has reviewed both investigator/institution and sponsor files and confirmed that all necessary documents are in the appropriate files.

Any or all of the documents addressed in this guideline may be subject to, and should be available for, audit by the sponsor's auditor and inspection by the regulatory authority(ies).

8.2 Before the Clinical Phase of the Trial Commences

During this planning stage the following documents should be generated and should be on file before the trial formally starts

	Title of Document	Purpose	Located in Files of Investigator/ Institution	Sponsor
8.2.1	**Investigator's Brochure**	To document that relevant and current scientific information about the investigational product has been provided to the investigator	X	X
8.2.2	**Signed Protocol and Amendments, if any, and sample Case Report Form (CRF)**	To document investigator and sponsor agreement to the protocol/amendment(s) and CRF	X	X
8.2.3	**Information given to Trial Subject**			
	– **Informed Consent Form** (including all applicable translations)	To document the informed consent	X	X
	– **Any Other Written Information**	To document that subjects will be given appropriate written information (content and wording) to support their ability to give fully informed consent	X	X
	– **Advertisement for Subject Recruitment** (if used)	To document that recruitment measures are appropriate and not coercive	X	
8.2.4	**Financial Aspects of the Trial**	To document the financial agreement between the investigator/institution and the sponsor for the trial	X	X
8.2.5	**Insurance Statement** (where required)	To document that compensation to subject(s) for trial-related injury will be available	X	X

8.2.5	**Insurance Statement** (where required)	To document that compensation to subject(s) for trial-related injury will be available	X	X
8.2.6	**Signed Agreement between Involved Parties,** e.g.:	To document agreements	X	X
	– investigator/institution and sponsor		X	X
	– investigator/institution and CRO		X	X
	– sponsor and CRO		X	(where required)
	– investigator/institution and authority(ies) (where required)			X X
8.2.7	**Dated, Documented Approval/Favourable Opinion of Institutional Review Board (IRB)/ Independent Ethics Committee (IEC) of the following:** – protocol and any amendments – CRF (if applicable) – informed consent form(s) – any other written information to be provided to the subject(s) – advertisement for subject recruitment (if used) – subject compensation (if any) – any other documents given approval/ favourable opinion	To document that the trial has been subject to IRB/IEC review and given approval/favourable opinion. To identify the version number and date of the document(s)	X	X

	Title of Document	Purpose	Located in Files of Investigator/ Institution	Located in Files of Sponsor
8.2.8	**Institutional Review Board/Independent Ethics Committee Composition**	To document that the IRB/IEC is constituted in agreement with GCP	X	X (where required)
8.2.9	**Regulatory Authority(ies) Authorization/Approval/Notification of Protocol** (where required)	To document appropriate authorization/ approval/notification by the regulatory authority(ies) has been obtained prior to initiation of the trial in compliance with the applicable regulatory requirement(s)	X (where required)	X (where required)
8.2.10	**Curriculum Vitae and/or Other Relevant Documents evidencing Qualifications of Investigator(s) and Sub-Investigator(s)**	To document qualifications and eligibility to conduct trial and/or provide medical supervision of subjects	X	X
8.2.11	**Normal Value(s)/range(s) for Medical/ Laboratory/Technical Procedure(s) and/or Test(s) included in the Protocol**	To document normal values and/or ranges of the tests	X	X
8.2.12	**Medical/Laboratory/Technical Procedures/ Tests** – certification or – accreditation or – established quality control and/or external quality assessment or – other validation (where required)	To document competence of facility to perform required test(s), and support reliability of results	X (where required)	X

8.2.13	**Sample of Label(s) attached to investigational product container(s)**	To document compliance with applicable labelling regulations and appropriateness of instructions provided to the subjects		X
8.2.14	**Instructions for Handling of Investigational Product(s) and Trial-Related Materials** (if not included in Protocol or Investigator's Brochure)	To document instructions needed to ensure proper storage, packaging, dispensing and disposition of investigational products and trial-related materials	X	X
8.2.15	**Shipping Records for Investigational Product(s) and Trial-Related Materials**	To document shipment dates, batch numbers and method of shipment of investigational product(s) and trial-related materials. Allows tracking of product batch, review of shipping conditions, and accountability	X	X
8.2.16	**Certificate(s) of Analysis of Investigational Product(s) Shipped**	To document identity, purity, and strength of investigational product(s) to be used in the trial		X
8.2.17	**Decoding Procedures for Blinded Trials**	To document how, in case of an emergency, identity of blinded investigational product can be revealed without breaking the blind for the remaining subjects' treatment	X	X (third party if applicable)
8.2.18	**Master Randomization List**	To document method for randomization of trial population		X (third party if applicable)
8.2.19	**Pre-Trial Monitoring Report**	To document that the site is suitable for the trial (may be combined with 8.2.20)		X

	Title of Document	Purpose	Located in Files of Investigator/ Institution	Sponsor
8.2.20	**Trial Initiation Monitoring Report**	To document that trial procedures were reviewed with the investigator and the investigator's trial staff (may be combined with 8.2.19)	X	X

8.3 During the Clinical Conduct of the Trial

In addition to having on file the above documents, the following should be added to the files during the trial as evidence that all new relevant information is documented as it becomes available

	Title of Document	Purpose	Located in Files of Investigator/ Institution	Sponsor
8.3.1	**Investigator's Brochure Updates**	To document that investigator is informed in a timely manner of relevant information as it becomes available	X	X
8.3.2	**Any Revision to:** – protocol/amendment(s) and CRF – informed consent form – any other written information provided to subjects – advertisement for subject recruitment (if used)	To document revisions of these trial related documents that take effect during trial	X	X

8.3.3	**Dated, Documented Approval/Favourable Opinion of Institutional Review Board (IRB)/ Independent Ethics Committee (IEC) of the following:** – protocol amendment(s) – revision(s) of: – informed consent form – any other written information to be provided to the subject – advertisement for subject recruitment (if used) – any other documents given approval/ favourable opinion – continuing review of trial (where required)	To document that the amendment(s) and/or revision(s) have been subject to IRB/IEC review and were given approval/favourable opinion. To identify the version number and date of the document(s)	X	X
8.3.4	**Regulatory Authority(ies) Authorizations/ Approvals/Notifications where required for:** – protocol amendment(s) and other documents	To document compliance with applicable regulatory requirements	X (where required)	X
8.3.5	**Curriculum Vitae for New Investigator(s) and/or Sub-Investigator(s)**	(see 8.2.10)	X	X
8.3.6	**Updates to Normal Value(s)/Range(s) for Medical/ Laboratory/ Technical Procedure(s)/ test(s) included in the Protocol**	To document normal values and ranges that are revised during the trial (see 8.2.11)	X	X

	Title of Document	Purpose	Located in Files of Investigator/ Institution	Located in Files of Sponsor
8.3.7	**Updates of Medical/Laboratory/Technical Procedures/Tests** – certification or – accreditation or – established quality control and/or external quality assessment or – other validation (where required)	To document that tests remain adequate throughout the trial period (see 8.2.12)	X (where required)	X
8.3.8	**Documentation of Investigational Product(s) and Trial-Related Materials Shipment**	(see 8.2.15)	X	X
8.3.9	**Certificate(s) of Analysis for New Batches of Investigational Products**	(see 8.2.16)		X
8.3.10	**Monitoring Visit Reports**	To document site visits by, and findings of, the monitor		X
8.3.11	**Relevant Communications other than Site Visits** – letters – meeting notes – notes of telephone calls	To document any agreements or significant discussions regarding trial administration, protocol violations, trial conduct, adverse event (AE) reporting	X	X
8.3.12	**Signed Informed Consent Forms**	To document that consent is obtained in accordance with GCP and protocol and dated prior to participation of each subject in trial. Also to document direct access permission (see 8.2.3)	X	

8.3.13	**Source Documents**	To document the existence of the subject and substantiate integrity of trial data collected. To include original documents related to the trial, to medical treatment, and history of subject	X	
8.3.14	**Signed, dated and Completed Case Report Forms (CRF)**	To document that the investigator or authorized member of the investigator's staff confirms the observations recorded	X (copy)	X (original)
8.3.15	**Documentation of CRF Corrections**	To document all changes/additions or corrections made to CRF after initial data were recorded	X (copy)	X (original)
8.3.16	**Notification by Originating Investigator to Sponsor of Serious Adverse Events and Related Reports**	Notification by originating investigator to sponsor of serious adverse events and related reports in accordance with 4.11	X	X
8.3.17	**Notification by Sponsor and/or Investigator, where applicable, to Regulatory Authority(ies) and IRB(s)/IEC(s) of Unexpected Serious Adverse Drug Reactions and of Other Safety Information**	Notification by sponsor and/or investigator, where applicable, to regulatory authorities and IRB(s)/IEC(s) of unexpected serious adverse drug reactions in accordance with 5.17 and 4.11.1 and of other safety information in accordance with 5.16.2 and 4.11.2	X (where required)	
8.3.18	**Notification by Sponsor to Investigators of Safety Information**	Notification by sponsor to investigators of safety information in accordance with 5.16.2	X	X
8.3.19	**Interim or Annual Reports to IRB/IEC and Authority(ies)**	Interim or annual reports provided to IRB/IEC in accordance with 4.10 and to authority(ies) in accordance with 5.17.3	X	X (where required)

	Title of Document	Purpose	Located in Files of Investigator/ Institution	Located in Files of Sponsor
8.3.20	**Subject Screening Log**	To document identification of subjects who entered pre-trial screening	X	X (where required)
8.3.21	**Subject Identification Code List**	To document that investigator/institution keeps a confidential list of names of all subjects allocated to trial numbers on enrolling in the trial. Allows investigator/institution to reveal identity of any subject	X	
8.3.22	**Subject Enrolment Log**	To document chronological enrolment of subjects by trial number	X	
8.3.23	**Investigational Products Accountability at the Site**	To document that investigational product(s) have been used according to the protocol	X	X
8.3.24	**Signature Sheet**	To document signatures and initials of all persons authorized to make entries and/or corrections on CRFs	X	X
8.3.25	**Record of Retained Body Fluids/Tissue Samples (if any)**	To document location and identification of retained samples if assays need to be repeated	X	X

8.4 After Completion or Termination of the Trial

After completion or termination of the trial, all of the documents identified in sections 8.2 and 8.3 should be in the file together with the following

	Title of Document	Purpose	Located in Files of Investigator/ Institution	Located in Files of Sponsor
8.4.1	**Investigational Product(s) Accountability at Site**	To document that the investigational product(s) have been used according to the protocol. To documents the final accounting of investigational product(s) received at the site, dispensed to subjects, returned by the subjects, and returned to sponsor	X	X
8.4.2	**Documentation of Investigational Product Destruction**	To document destruction of unused investigational products by sponsor or at site	X (if destroyed at site)	X
8.4.3	**Completed Subject Identification Code List**	To permit identification of all subjects enrolled in the trial in case follow-up is required. List should be kept in a confidential manner and for agreed upon time	X	
8.4.4	**Audit Certificate** (if available)	To document that audit was performed		X
8.4.5	**Final Trial Close-Out Monitoring Report**	To document that all activities required for trial close-out are completed, and copies of essential documents are held in the appropriate files		X

	Title of Document	Purpose	Located in Files of Investigator/ Institution	Sponsor
8.4.6	**Treatment Allocation and Decoding Documentation**	Returned to sponsor to document any decoding that may have occurred		X
8.4.7	**Final Report by Investigator to IRB/IEC where required, and where applicable, to the Regulatory Authority(ies)**	To document completion of the trial	X	
8.4.8	**Clinical Study Report**	To document results and interpretation of trial	X (if applicable)	X

INTERNATIONAL CONFERENCE ON HARMONISATION OF
TECHNICAL REQUIREMENTS FOR REGISTRATION OF PHARMACEUTICALS
FOR HUMAN USE

ICH Harmonised Tripartite Guideline

STATISTICAL PRINCIPLES FOR CLINICAL TRIALS

Recommended for Adoption
at Step 4 of the ICH Process
on 5 February 1998
by the ICH Steering Committee

This Guideline has been developed by the appropriate ICH Expert Working Group and has been subject to consultation by the regulatory parties, in accordance with the ICH Process. At Step 4 of the Process the final draft is recommended for adoption to the regulatory bodies of the European Union, Japan and USA.

STATISTICAL PRINCIPLES FOR CLINICAL TRIALS

ICH Harmonised Tripartite Guideline

Having reached Step 4 of the ICH Process at the
ICH Steering Committee meeting on 5 February 1998,
this guideline is recommended for adoption
to the three regulatory parties to ICH

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STATISTICAL PRINCIPLES FOR CLINICAL TRIALS

1. INTRODUCTION

1.1 Background and Purpose

The efficacy and safety of medicinal products should be demonstrated by clinical trials which follow the guidance in 'Good Clinical Practice: Consolidated Guideline' (ICH E6) adopted by the ICH, 1 May 1996. The role of statistics in clinical trial design and analysis is acknowledged as essential in that ICH guideline. The proliferation of statistical research in the area of clinical trials coupled with the critical role of clinical research in the drug approval process and health care in general necessitate a succinct document on statistical issues related to clinical trials. This guidance is written primarily to attempt to harmonize the principles of statistical methodology applied to clinical trials for marketing applications submitted in Europe, Japan and the United States.

As a starting point, this guideline utilized the CPMP (Committee for Proprietary Medicinal Products) Note for Guidance entitled 'Biostatistical Methodology in Clinical Trials in Applications for Marketing Authorizations for Medicinal Products' (December, 1994). It was also influenced by 'Guidelines on the Statistical Analysis of Clinical Studies' (March, 1992) from the Japanese Ministry of Health and Welfare and the U.S. Food and Drug Administration document entitled 'Guideline for the Format and Content of the Clinical and Statistical Sections of a New Drug Application' (July, 1988). Some topics related to statistical principles and methodology are also embedded within other ICH guidelines, particularly those listed below. The specific guidance that contains related text will be identified in various sections of this document.

- E1A: The Extent of Population Exposure to Assess Clinical Safety
- E2A: Clinical Safety Data Management: Definitions and Standards for Expedited Reporting
- E2B: Clinical Safety Data Management: Data Elements for Transmission of Individual Case Safety Reports
- E2C: Clinical Safety Data Management: Periodic Safety Update Reports for Marketed Drugs
- E3: Structure and Content of Clinical Study Reports
- E4: Dose-Response Information to Support Drug Registration
- E5: Ethnic Factors in the Acceptability of Foreign Clinical Data
- E6: Good Clinical Practice: Consolidated Guideline
- E7: Studies in Support of Special Populations: Geriatrics
- E8: General Considerations for Clinical Trials
- E10: Choice of Control Group in Clinical Trials
- M1: Standardization of Medical Terminology for Regulatory Purposes
- M3: Non-Clinical Safety Studies for the Conduct of Human Clinical Trials for Pharmaceuticals.

This guidance is intended to give direction to sponsors in the design, conduct, analysis, and evaluation of clinical trials of an investigational product in the context of its overall clinical development. The document will also assist scientific experts charged with preparing application summaries or assessing evidence of efficacy and safety, principally from clinical trials in later phases of development.

1.2 Scope and Direction

The focus of this guidance is on statistical principles. It does not address the use of specific statistical procedures or methods. Specific procedural steps to ensure that principles are implemented properly are the responsibility of the sponsor. Integration of data across clinical trials is discussed, but is not a primary focus of this guidance. Selected principles and procedures related to data management or clinical trial monitoring activities are covered in other ICH guidelines and are not addressed here.

This guidance should be of interest to individuals from a broad range of scientific disciplines. However, it is assumed that the actual responsibility for all statistical work associated with clinical trials will lie with an appropriately qualified and experienced statistician, as indicated in ICH E6. The role and responsibility of the trial statistician (see Glossary), in collaboration with other clinical trial professionals, is to ensure that statistical principles are applied appropriately in clinical trials supporting drug development. Thus, the trial statistician should have a combination of education/training and experience sufficient to implement the principles articulated in this guidance.

For each clinical trial contributing to a marketing application, all important details of its design and conduct and the principal features of its proposed statistical analysis should be clearly specified in a protocol written before the trial begins. The extent to which the procedures in the protocol are followed and the primary analysis is planned a priori will contribute to the degree of confidence in the final results and conclusions of the trial. The protocol and subsequent amendments should be approved by the responsible personnel, including the trial statistician. The trial statistician should ensure that the protocol and any amendments cover all relevant statistical issues clearly and accurately, using technical terminology as appropriate.

The principles outlined in this guidance are primarily relevant to clinical trials conducted in the later phases of development, many of which are confirmatory trials of efficacy. In addition to efficacy, confirmatory trials may have as their primary variable a safety variable (e.g. an adverse event, a clinical laboratory variable or an electrocardiographic measure), a pharmacodynamic or a pharmacokinetic variable (as in a confirmatory bioequivalence trial). Furthermore, some confirmatory findings may be derived from data integrated across trials, and selected principles in this guidance are applicable in this situation. Finally, although the early phases of drug development consist mainly of clinical trials that are exploratory in nature, statistical principles are also relevant to these clinical trials. Hence, the substance of this document should be applied as far as possible to all phases of clinical development.

Many of the principles delineated in this guidance deal with minimizing bias (see Glossary) and maximizing precision. As used in this guidance, the term 'bias'

describes the systematic tendency of any factors associated with the design, conduct, analysis and interpretation of the results of clinical trials to make the estimate of a treatment effect (see Glossary) deviate from its true value. It is important to identify potential sources of bias as completely as possible so that attempts to limit such bias may be made. The presence of bias may seriously compromise the ability to draw valid conclusions from clinical trials.

Some sources of bias arise from the design of the trial, for example an assignment of treatments such that subjects at lower risk are systematically assigned to one treatment. Other sources of bias arise during the conduct and analysis of a clinical trial. For example, protocol violations and exclusion of subjects from analysis based upon knowledge of subject outcomes are possible sources of bias that may affect the accurate assessment of the treatment effect. Because bias can occur in subtle or unknown ways and its effect is not measurable directly, it is important to evaluate the robustness of the results and primary conclusions of the trial. Robustness is a concept that refers to the sensitivity of the overall conclusions to various limitations of the data, assumptions, and analytic approaches to data analysis. Robustness implies that the treatment effect and primary conclusions of the trial are not substantially affected when analyses are carried out based on alternative assumptions or analytic approaches. The interpretation of statistical measures of uncertainty of the treatment effect and treatment comparisons should involve consideration of the potential contribution of bias to the p-value, confidence interval, or inference.

Because the predominant approaches to the design and analysis of clinical trials have been based on frequentist statistical methods, the guidance largely refers to the use of frequentist methods (see Glossary) when discussing hypothesis testing and/or confidence intervals. This should not be taken to imply that other approaches are not appropriate: the use of Bayesian (see Glossary) and other approaches may be considered when the reasons for their use are clear and when the resulting conclusions are sufficiently robust.

2. CONSIDERATIONS FOR OVERALL CLINICAL DEVELOPMENT

2.1 Trial Context

2.1.1 DEVELOPMENT PLAN

The broad aim of the process of clinical development of a new drug is to find out whether there is a dose range and schedule at which the drug can be shown to be simultaneously safe and effective, to the extent that the risk-benefit relationship is acceptable. The particular subjects who may benefit from the drug, and the specific indications for its use, also need to be defined.

Satisfying these broad aims usually requires an ordered programme of clinical trials, each with its own specific objectives (see ICH E8). This should be specified in a clinical plan, or a series of plans, with appropriate decision points and flexibility to allow modification as knowledge accumulates. A marketing application should clearly describe the main content of such plans, and the contribution made by each trial. Interpretation and assessment of the evidence from the total programme of

trials involves synthesis of the evidence from the individual trials (see Section 7.2). This is facilitated by ensuring that common standards are adopted for a number of features of the trials such as dictionaries of medical terms, definition and timing of the main measurements, handling of protocol deviations and so on. A statistical summary, overview or meta-analysis (see Glossary) may be informative when medical questions are addressed in more than one trial. Where possible this should be envisaged in the plan so that the relevant trials are clearly identified and any necessary common features of their designs are specified in advance. Other major statistical issues (if any) that are expected to affect a number of trials in a common plan should be addressed in that plan.

2.1.2 CONFIRMATORY TRIAL

A confirmatory trial is an adequately controlled trial in which the hypotheses are stated in advance and evaluated. As a rule, confirmatory trials are necessary to provide firm evidence of efficacy or safety. In such trials the key hypothesis of interest follows directly from the trial's primary objective, is always pre-defined, and is the hypothesis that is subsequently tested when the trial is complete. In a confirmatory trial it is equally important to estimate with due precision the size of the effects attributable to the treatment of interest and to relate these effects to their clinical significance.

Confirmatory trials are intended to provide firm evidence in support of claims and hence adherence to protocols and standard operating procedures is particularly important; unavoidable changes should be explained and documented, and their effect examined. A justification of the design of each such trial, and of other important statistical aspects such as the principal features of the planned analysis, should be set out in the protocol. Each trial should address only a limited number of questions.

Firm evidence in support of claims requires that the results of the confirmatory trials demonstrate that the investigational product under test has clinical benefits. The confirmatory trials should therefore be sufficient to answer each key clinical question relevant to the efficacy or safety claim clearly and definitively. In addition, it is important that the basis for generalization (see Glossary) to the intended patient population is understood and explained; this may also influence the number and type (e.g. specialist or general practitioner) of centres and/or trials needed. The results of the confirmatory trial(s) should be robust. In some circumstances the weight of evidence from a single confirmatory trial may be sufficient.

2.1.3 EXPLORATORY TRIAL

The rationale and design of confirmatory trials nearly always rests on earlier clinical work carried out in a series of exploratory studies. Like all clinical trials, these exploratory studies should have clear and precise objectives. However, in contrast to confirmatory trials, their objectives may not always lead to simple tests of predefined hypotheses. In addition, exploratory trials may sometimes require a more flexible approach to design so that changes can be made in response to accumulating results. Their analysis may entail data exploration; tests of hypothesis may be carried out, but the choice of hypothesis may be data dependent. Such trials

cannot be the basis of the formal proof of efficacy, although they may contribute to the total body of relevant evidence.

Any individual trial may have both confirmatory and exploratory aspects. For example, in most confirmatory trials the data are also subjected to exploratory analyses which serve as a basis for explaining or supporting their findings and for suggesting further hypotheses for later research. The protocol should make a clear distinction between the aspects of a trial which will be used for confirmatory proof and the aspects which will provide data for exploratory analysis.

2.2 Scope of Trials

2.2.1 POPULATION

In the earlier phases of drug development the choice of subjects for a clinical trial may be heavily influenced by the wish to maximize the chance of observing specific clinical effects of interest, and hence they may come from a very narrow subgroup of the total patient population for which the drug may eventually be indicated. However by the time the confirmatory trials are undertaken, the subjects in the trials should more closely mirror the target population. Hence, in these trials it is generally helpful to relax the inclusion and exclusion criteria as much as possible within the target population, while maintaining sufficient homogeneity to permit precise estimation of treatment effects. No individual clinical trial can be expected to be totally representative of future users, because of the possible influences of geographical location, the time when it is conducted, the medical practices of the particular investigator(s) and clinics, and so on. However the influence of such factors should be reduced wherever possible, and subsequently discussed during the interpretation of the trial results.

2.2.2 PRIMARY AND SECONDARY VARIABLES

The primary variable ('target' variable, primary endpoint) should be the variable capable of providing the most clinically relevant and convincing evidence directly related to the primary objective of the trial. There should generally be only one primary variable. This will usually be an efficacy variable, because the primary objective of most confirmatory trials is to provide strong scientific evidence regarding efficacy. Safety/tolerability may sometimes be the primary variable, and will always be an important consideration. Measurements relating to quality of life and health economics are further potential primary variables. The selection of the primary variable should reflect the accepted norms and standards in the relevant field of research. The use of a reliable and validated variable with which experience has been gained either in earlier studies or in published literature is recommended. There should be sufficient evidence that the primary variable can provide a valid and reliable measure of some clinically relevant and important treatment benefit in the patient population described by the inclusion and exclusion criteria. The primary variable should generally be the one used when estimating the sample size (see Section 3.5).

In many cases, the approach to assessing subject outcome may not be straightforward and should be carefully defined. For example, it is inadequate to specify mor-

tality as a primary variable without further clarification; mortality may be assessed by comparing proportions alive at fixed points in time, or by comparing overall distributions of survival times over a specified interval. Another common example is a recurring event; the measure of treatment effect may again be a simple dichotomous variable (any occurrence during a specified interval), time to first occurrence, rate of occurrence (events per time units of observation), etc. The assessment of functional status over time in studying treatment for chronic disease presents other challenges in selection of the primary variable. There are many possible approaches, such as comparisons of the assessments done at the beginning and end of the interval of observation, comparisons of slopes calculated from all assessments throughout the interval, comparisons of the proportions of subjects exceeding or declining beyond a specified threshold, or comparisons based on methods for repeated measures data. To avoid multiplicity concerns arising from post hoc definitions, it is critical to specify in the protocol the precise definition of the primary variable as it will be used in the statistical analysis. In addition, the clinical relevance of the specific primary variable selected and the validity of the associated measurement procedures will generally need to be addressed and justified in the protocol.

The primary variable should be specified in the protocol, along with the rationale for its selection. Redefinition of the primary variable after unblinding will almost always be unacceptable, since the biases this introduces are difficult to assess. When the clinical effect defined by the primary objective is to be measured in more than one way, the protocol should identify one of the measurements as the primary variable on the basis of clinical relevance, importance, objectivity, and/or other relevant characteristics, whenever such selection is feasible.

Secondary variables are either supportive measurements related to the primary objective or measurements of effects related to the secondary objectives. Their predefinition in the protocol is also important, as well as an explanation of their relative importance and roles in interpretation of trial results. The number of secondary variables should be limited and should be related to the limited number of questions to be answered in the trial.

2.2.3 COMPOSITE VARIABLES

If a single primary variable cannot be selected from multiple measurements associated with the primary objective, another useful strategy is to integrate or combine the multiple measurements into a single or 'composite' variable, using a pre-defined algorithm. Indeed, the primary variable sometimes arises as a combination of multiple clinical measurements (e.g. the rating scales used in arthritis, psychiatric disorders and elsewhere). This approach addresses the multiplicity problem without requiring adjustment to the type I error. The method of combining the multiple measurements should be specified in the protocol, and an interpretation of the resulting scale should be provided in terms of the size of a clinically relevant benefit. When a composite variable is used as a primary variable, the components of this variable may sometimes be analysed separately, where clinically meaningful and validated. When a rating scale is used as a primary variable, it is especially important to address such factors as content validity (see Glossary), inter- and intra-rater

reliability (see Glossary) and responsiveness for detecting changes in the severity of disease.

2.2.4 GLOBAL ASSESSMENT VARIABLES

In some cases, 'global assessment' variables (see Glossary) are developed to measure the overall safety, overall efficacy, and/or overall usefulness of a treatment. This type of variable integrates objective variables and the investigator's overall impression about the state or change in the state of the subject, and is usually a scale of ordered categorical ratings. Global assessments of overall efficacy are well established in some therapeutic areas, such as neurology and psychiatry.

Global assessment variables generally have a subjective component. When a global assessment variable is used as a primary or secondary variable, fuller details of the scale should be included in the protocol with respect to:

1) the relevance of the scale to the primary objective of the trial;
2) the basis for the validity and reliability of the scale;
3) how to utilize the data collected on an individual subject to assign him/her to a unique category of the scale;
4) how to assign subjects with missing data to a unique category of the scale, or otherwise evaluate them.

If objective variables are considered by the investigator when making a global assessment, then those objective variables should be considered as additional primary, or at least important secondary, variables.

Global assessment of usefulness integrates components of both benefit and risk and reflects the decision making process of the treating physician, who must weigh benefit and risk in making product use decisions. A problem with global usefulness variables is that their use could in some cases lead to the result of two products being declared equivalent despite having very different profiles of beneficial and adverse effects. For example, judging the global usefulness of a treatment as equivalent or superior to an alternative may mask the fact that it has little or no efficacy but fewer adverse effects. Therefore it is not advisable to use a global usefulness variable as a primary variable. If global usefulness is specified as primary, it is important to consider specific efficacy and safety outcomes separately as additional primary variables.

2.2.5 MULTIPLE PRIMARY VARIABLES

It may sometimes be desirable to use more than one primary variable, each of which (or a subset of which) could be sufficient to cover the range of effects of the therapies. The planned manner of interpretation of this type of evidence should be carefully spelled out. It should be clear whether an impact on any of the variables, some minimum number of them, or all of them, would be considered necessary to achieve the trial objectives. The primary hypothesis or hypotheses and parameters of interest (e.g. mean, percentage, distribution) should be clearly stated with respect to the primary variables identified, and the approach to statistical inference described. The effect on the type I error should be explained because of the potential for multiplicity problems (see Section 5.6); the method of controlling type I

error should be given in the protocol. The extent of intercorrelation among the proposed primary variables may be considered in evaluating the impact on type I error. If the purpose of the trial is to demonstrate effects on all of the designated primary variables, then there is no need for adjustment of the type I error, but the impact on type II error and sample size should be carefully considered.

2.2.6 SURROGATE VARIABLES

When direct assessment of the clinical benefit to the subject through observing actual clinical efficacy is not practical, indirect criteria (surrogate variables – see Glossary) may be considered. Commonly accepted surrogate variables are used in a number of indications where they are believed to be reliable predictors of clinical benefit. There are two principal concerns with the introduction of any proposed surrogate variable. First, it may not be a true predictor of the clinical outcome of interest. For example it may measure treatment activity associated with one specific pharmacological mechanism, but may not provide full information on the range of actions and ultimate effects of the treatment, whether positive or negative. There have been many instances where treatments showing a highly positive effect on a proposed surrogate have ultimately been shown to be detrimental to the subjects' clinical outcome; conversely, there are cases of treatments conferring clinical benefit without measurable impact on proposed surrogates. Secondly, proposed surrogate variables may not yield a quantitative measure of clinical benefit that can be weighed directly against adverse effects. Statistical criteria for validating surrogate variables have been proposed but the experience with their use is relatively limited. In practice, the strength of the evidence for surrogacy depends upon (i) the biological plausibility of the relationship, (ii) the demonstration in epidemiological studies of the prognostic value of the surrogate for the clinical outcome and (iii) evidence from clinical trials that treatment effects on the surrogate correspond to effects on the clinical outcome. Relationships between clinical and surrogate variables for one product do not necessarily apply to a product with a different mode of action for treating the same disease.

2.2.7 CATEGORIZED VARIABLES

Dichotomization or other categorization of continuous or ordinal variables may sometimes be desirable. Criteria of 'success' and 'response' are common examples of dichotomies which require precise specification in terms of, for example, a minimum percentage improvement (relative to baseline) in a continuous variable, or a ranking categorized as at or above some threshold level (e.g. 'good') on an ordinal rating scale. The reduction of diastolic blood pressure below 90 mmHg is a common dichotomization. Categorizations are most useful when they have clear clinical relevance. The criteria for categorization should be pre-defined and specified in the protocol, as knowledge of trial results could easily bias the choice of such criteria. Because categorization normally implies a loss of information, a consequence will be a loss of power in the analysis; this should be accounted for in the sample size calculation.

2.3 Design Techniques to Avoid Bias

The most important design techniques for avoiding bias in clinical trials are blinding and randomization, and these should be normal features of most controlled clinical trials intended to be included in a marketing application. Most such trials follow a double-blind approach in which treatments are pre-packed in accordance with a suitable randomization schedule, and supplied to the trial centre(s) labelled only with the subject number and the treatment period so that no one involved in the conduct of the trial is aware of the specific treatment allocated to any particular subject, not even as a code letter. This approach will be assumed in Section 2.3.1 and most of Section 2.3.2, exceptions being considered at the end.

Bias can also be reduced at the design stage by specifying procedures in the protocol aimed at minimising any anticipated irregularities in trial conduct that might impair a satisfactory analysis, including various types of protocol violations, withdrawals and missing values. The protocol should consider ways both to reduce the frequency of such problems, and also to handle the problems that do occur in the analysis of data.

2.3.1 BLINDING

Blinding or masking is intended to limit the occurrence of conscious and unconscious bias in the conduct and interpretation of a clinical trial arising from the influence which the knowledge of treatment may have on the recruitment and allocation of subjects, their subsequent care, the attitudes of subjects to the treatments, the assessment of end-points, the handling of withdrawals, the exclusion of data from analysis, and so on. The essential aim is to prevent identification of the treatments until all such opportunities for bias have passed.

A double-blind trial is one in which neither the subject nor any of the investigator or sponsor staff who are involved in the treatment or clinical evaluation of the subjects are aware of the treatment received. This includes anyone determining subject eligibility, evaluating endpoints, or assessing compliance with the protocol. This level of blinding is maintained throughout the conduct of the trial, and only when the data are cleaned to an acceptable level of quality will appropriate personnel be unblinded. If any of the sponsor staff who are not involved in the treatment or clinical evaluation of the subjects are required to be unblinded to the treatment code (e.g. bioanalytical scientists, auditors, those involved in serious adverse event reporting), the sponsor should have adequate standard operating procedures to guard against inappropriate dissemination of treatment codes. In a single-blind trial the investigator and/or his staff are aware of the treatment but the subject is not, or vice versa. In an open-label trial the identity of treatment is known to all. The double-blind trial is the optimal approach. This requires that the treatments to be applied during the trial cannot be distinguished (appearance, taste, etc.) either before or during administration, and that the blind is maintained appropriately during the whole trial.

Difficulties in achieving the double-blind ideal can arise: the treatments may be of a completely different nature, for example, surgery and drug therapy; two drugs may have different formulations and, although they could be made indistinguishable by

the use of capsules, changing the formulation might also change the pharmacokinetic and/or pharmacodynamic properties and hence require that bioequivalence of the formulations be established; the daily pattern of administration of two treatments may differ. One way of achieving double-blind conditions under these circumstances is to use a 'double-dummy' (see Glossary) technique. This technique may sometimes force an administration scheme that is sufficiently unusual to influence adversely the motivation and compliance of the subjects. Ethical difficulties may also interfere with its use when, for example, it entails dummy operative procedures. Nevertheless, extensive efforts should be made to overcome these difficulties.

The double-blind nature of some clinical trials may be partially compromised by apparent treatment induced effects. In such cases, blinding may be improved by blinding investigators and relevant sponsor staff to certain test results (e.g. selected clinical laboratory measures). Similar approaches (see below) to minimizing bias in open-label trials should be considered in trials where unique or specific treatment effects may lead to unblinding individual patients.

If a double-blind trial is not feasible, then the single-blind option should be considered. In some cases only an open-label trial is practically or ethically possible. Single-blind and open-label trials provide additional flexibility, but it is particularly important that the investigator's knowledge of the next treatment should not influence the decision to enter the subject; this decision should precede knowledge of the randomized treatment. For these trials, consideration should be given to the use of a centralized randomization method, such as telephone randomization, to administer the assignment of randomized treatment. In addition, clinical assessments should be made by medical staff who are not involved in treating the subjects and who remain blind to treatment. In single-blind or open-label trials every effort should be made to minimize the various known sources of bias and primary variables should be as objective as possible. The reasons for the degree of blinding adopted should be explained in the protocol, together with steps taken to minimize bias by other means. For example, the sponsor should have adequate standard operating procedures to ensure that access to the treatment code is appropriately restricted during the process of cleaning the database prior to its release for analysis.

Breaking the blind (for a single subject) should be considered only when knowledge of the treatment assignment is deemed essential by the subject's physician for the subject's care. Any intentional or unintentional breaking of the blind should be reported and explained at the end of the trial, irrespective of the reason for its occurrence. The procedure and timing for revealing the treatment assignments should be documented.

In this document, the blind review (see Glossary) of data refers to the checking of data during the period of time between trial completion (the last observation on the last subject) and the breaking of the blind.

2.3.2 RANDOMIZATION

Randomization introduces a deliberate element of chance into the assignment of treatments to subjects in a clinical trial. During subsequent analysis of the trial

data, it provides a sound statistical basis for the quantitative evaluation of the evidence relating to treatment effects. It also tends to produce treatment groups in which the distributions of prognostic factors, known and unknown, are similar. In combination with blinding, randomization helps to avoid possible bias in the selection and allocation of subjects arising from the predictability of treatment assignments.

The randomization schedule of a clinical trial documents the random allocation of treatments to subjects. In the simplest situation it is a sequential list of treatments (or treatment sequences in a cross-over trial) or corresponding codes by subject number. The logistics of some trials, such as those with a screening phase, may make matters more complicated, but the unique pre-planned assignment of treatment, or treatment sequence, to subject should be clear. Different trial designs will require different procedures for generating randomization schedules. The randomization schedule should be reproducible (if the need arises).

Although unrestricted randomization is an acceptable approach, some advantages can generally be gained by randomising subjects in blocks. This helps to increase the comparability of the treatment groups, particularly when subject characteristics may change over time, as a result, for example, of changes in recruitment policy. It also provides a better guarantee that the treatment groups will be of nearly equal size. In cross-over trials it provides the means of obtaining balanced designs with their greater efficiency and easier interpretation. Care should be taken to choose block lengths that are sufficiently short to limit possible imbalance, but that are long enough to avoid predictability towards the end of the sequence in a block. Investigators and other relevant staff should generally be blind to the block length; the use of two or more block lengths, randomly selected for each block, can achieve the same purpose. (Theoretically, in a double-blind trial predictability does not matter, but the pharmacological effects of drugs may provide the opportunity for intelligent guesswork.)

In multicentre trials (see Glossary) the randomization procedures should be organized centrally. It is advisable to have a separate random scheme for each centre, i.e. to stratify by centre or to allocate several whole blocks to each centre. More generally, stratification by important prognostic factors measured at baseline (e.g. severity of disease, age, sex, etc.) may sometimes be valuable in order to promote balanced allocation within strata; this has greater potential benefit in small trials. The use of more than two or three stratification factors is rarely necessary, is less successful at achieving balance and is logistically troublesome. The use of a dynamic allocation procedure (see below) may help to achieve balance across a number of stratification factors simultaneously provided the rest of the trial procedures can be adjusted to accommodate an approach of this type. Factors on which randomization has been stratified should be accounted for later in the analysis.

The next subject to be randomized into a trial should always receive the treatment corresponding to the next free number in the appropriate randomization schedule (in the respective stratum, if randomization is stratified). The appropriate number and associated treatment for the next subject should only be allocated when entry of that subject to the randomized part of the trial has been confirmed. Details of

the randomization that facilitate predictability (e.g. block length) should not be contained in the trial protocol. The randomization schedule itself should be filed securely by the sponsor or an independent party in a manner that ensures that blindness is properly maintained throughout the trial. Access to the randomization schedule during the trial should take into account the possibility that, in an emergency, the blind may have to be broken for any subject. The procedure to be followed, the necessary documentation, and the subsequent treatment and assessment of the subject should all be described in the protocol.

Dynamic allocation is an alternative procedure in which the allocation of treatment to a subject is influenced by the current balance of allocated treatments and, in a stratified trial, by the stratum to which the subject belongs and the balance within that stratum. Deterministic dynamic allocation procedures should be avoided and an appropriate element of randomization should be incorporated for each treatment allocation. Every effort should be made to retain the double-blind status of the trial. For example, knowledge of the treatment code may be restricted to a central trial office from where the dynamic allocation is controlled, generally through telephone contact. This in turn permits additional checks of eligibility criteria and establishes entry into the trial, features that can be valuable in certain types of multicentre trial. The usual system of pre-packing and labelling drug supplies for double-blind trials can then be followed, but the order of their use is no longer sequential. It is desirable to use appropriate computer algorithms to keep personnel at the central trial office blind to the treatment code. The complexity of the logistics and potential impact on the analysis should be carefully evaluated when considering dynamic allocation.

3. TRIAL DESIGN CONSIDERATIONS

3.1 Design Configuration

3.1.1 PARALLEL GROUP DESIGN

The most common clinical trial design for confirmatory trials is the parallel group design in which subjects are randomized to one of two or more arms, each arm being allocated a different treatment. These treatments will include the investigational product at one or more doses, and one or more control treatments, such as placebo and/or an active comparator. The assumptions underlying this design are less complex than for most other designs. However, as with other designs, there may be additional features of the trial that complicate the analysis and interpretation (e.g. covariates, repeated measurements over time, interactions between design factors, protocol violations, dropouts (see Glossary) and withdrawals).

3.1.2 CROSS-OVER DESIGN

In the cross-over design, each subject is randomized to a sequence of two or more treatments, and hence acts as his own control for treatment comparisons. This simple manoeuvre is attractive primarily because it reduces the number of subjects and usually the number of assessments needed to achieve a specific power, sometimes to a marked extent. In the simplest 2×2 cross-over design each subject receives each of two treatments in randomized order in two successive treatment

periods, often separated by a washout period. The most common extension of this entails comparing n(>2) treatments in n periods, each subject receiving all n treatments. Numerous variations exist, such as designs in which each subject receives a subset of n(>2) treatments, or ones in which treatments are repeated within a subject.

Cross-over designs have a number of problems that can invalidate their results. The chief difficulty concerns carry-over, that is, the residual influence of treatments in subsequent treatment periods. In an additive model the effect of unequal carry-over will be to bias direct treatment comparisons. In the 2×2 design the carry-over effect cannot be statistically distinguished from the interaction between treatment and period and the test for either of these effects lacks power because the corresponding contrast is 'between subject'. This problem is less acute in higher order designs, but cannot be entirely dismissed.

When the cross-over design is used it is therefore important to avoid carry-over. This is best done by selective and careful use of the design on the basis of adequate knowledge of both the disease area and the new medication. The disease under study should be chronic and stable. The relevant effects of the medication should develop fully within the treatment period. The washout periods should be sufficiently long for complete reversibility of drug effect. The fact that these conditions are likely to be met should be established in advance of the trial by means of prior information and data.

There are additional problems that need careful attention in cross-over trials. The most notable of these are the complications of analysis and interpretation arising from the loss of subjects. Also, the potential for carry-over leads to difficulties in assigning adverse events which occur in later treatment periods to the appropriate treatment. These, and other issues, are described in ICH E4. The cross-over design should generally be restricted to situations where losses of subjects from the trial are expected to be small.

A common, and generally satisfactory, use of the 2×2 cross-over design is to demonstrate the bioequivalence of two formulations of the same medication. In this particular application in healthy volunteers, carry-over effects on the relevant pharmacokinetic variable are most unlikely to occur if the wash-out time between the two periods is sufficiently long. However it is still important to check this assumption during analysis on the basis of the data obtained, for example by demonstrating that no drug is detectable at the start of each period.

3.1.3 FACTORIAL DESIGNS

In a factorial design two or more treatments are evaluated simultaneously through the use of varying combinations of the treatments. The simplest example is the 2×2 factorial design in which subjects are randomly allocated to one of the four possible combinations of two treatments, A and B say. These are: A alone; B alone; both A and B; neither A nor B. In many cases this design is used for the specific purpose of examining the interaction of A and B. The statistical test of interaction may lack power to detect an interaction if the sample size was calculated based on the test for main effects. This consideration is important when this design is used

for examining the joint effects of A and B, in particular, if the treatments are likely to be used together.

Another important use of the factorial design is to establish the dose-response characteristics of the simultaneous use of treatments C and D, especially when the efficacy of each monotherapy has been established at some dose in prior trials. A number, m, of doses of C is selected, usually including a zero dose (placebo), and a similar number, n, of doses of D. The full design then consists of $m \times n$ treatment groups, each receiving a different combination of doses of C and D. The resulting estimate of the response surface may then be used to help to identify an appropriate combination of doses of C and D for clinical use (see ICH E4).

In some cases, the 2×2 design may be used to make efficient use of clinical trial subjects by evaluating the efficacy of the two treatments with the same number of subjects as would be required to evaluate the efficacy of either one alone. This strategy has proved to be particularly valuable for very large mortality trials. The efficiency and validity of this approach depends upon the absence of interaction between treatments A and B so that the effects of A and B on the primary efficacy variables follow an additive model, and hence the effect of A is virtually identical whether or not it is additional to the effect of B. As for the cross-over trial, evidence that this condition is likely to be met should be established in advance of the trial by means of prior information and data.

3.2 Multicentre Trials

Multicentre trials are carried out for two main reasons. Firstly, a multicentre trial is an accepted way of evaluating a new medication more efficiently; under some circumstances, it may present the only practical means of accruing sufficient subjects to satisfy the trial objective within a reasonable time-frame. Multicentre trials of this nature may, in principle, be carried out at any stage of clinical development. They may have several centres with a large number of subjects per centre or, in the case of a rare disease, they may have a large number of centres with very few subjects per centre.

Secondly, a trial may be designed as a multicentre (and multi-investigator) trial primarily to provide a better basis for the subsequent generalization of its findings. This arises from the possibility of recruiting the subjects from a wider population and of administering the medication in a broader range of clinical settings, thus presenting an experimental situation that is more typical of future use. In this case the involvement of a number of investigators also gives the potential for a wider range of clinical judgement concerning the value of the medication. Such a trial would be a confirmatory trial in the later phases of drug development and would be likely to involve a large number of investigators and centres. It might sometimes be conducted in a number of different countries in order to facilitate generalizability (see Glossary) even further.

If a multicentre trial is to be meaningfully interpreted and extrapolated, then the manner in which the protocol is implemented should be clear and similar at all centres. Furthermore the usual sample size and power calculations depend upon the assumption that the differences between the compared treatments in the centres

are unbiased estimates of the same quantity. It is important to design the common protocol and to conduct the trial with this background in mind. Procedures should be standardized as completely as possible. Variation of evaluation criteria and schemes can be reduced by investigator meetings, by the training of personnel in advance of the trial and by careful monitoring during the trial. Good design should generally aim to achieve the same distribution of subjects to treatments within each centre and good management should maintain this design objective. Trials that avoid excessive variation in the numbers of subjects per centre and trials that avoid a few very small centres have advantages if it is later found necessary to take into account the heterogeneity of the treatment effect from centre to centre, because they reduce the differences between different weighted estimates of the treatment effect. (This point does not apply to trials in which all centres are very small and in which centre does not feature in the analysis.) Failure to take these precautions, combined with doubts about the homogeneity of the results may, in severe cases, reduce the value of a multicentre trial to such a degree that it cannot be regarded as giving convincing evidence for the sponsor's claims.

In the simplest multicentre trial, each investigator will be responsible for the subjects recruited at one hospital, so that 'centre' is identified uniquely by either investigator or hospital. In many trials, however, the situation is more complex. One investigator may recruit subjects from several hospitals; one investigator may represent a team of clinicians (subinvestigators) who all recruit subjects from their own clinics at one hospital or at several associated hospitals. Whenever there is room for doubt about the definition of centre in a statistical model, the statistical section of the protocol (see Section 5.1) should clearly define the term (e.g. by investigator, location or region) in the context of the particular trial. In most instances centres can be satisfactorily defined through the investigators and ICH E6 provides relevant guidance in this respect. In cases of doubt the aim should be to define centres so as to achieve homogeneity in the important factors affecting the measurements of the primary variables and the influence of the treatments. Any rules for combining centres in the analysis should be justified and specified prospectively in the protocol where possible, but in any case decisions concerning this approach should always be taken blind to treatment, for example at the time of the blind review.

The statistical model to be adopted for the estimation and testing of treatment effects should be described in the protocol. The main treatment effect may be investigated first using a model which allows for centre differences, but does not include a term for treatment-by-centre interaction. If the treatment effect is homogeneous across centres, the routine inclusion of interaction terms in the model reduces the efficiency of the test for the main effects. In the presence of true heterogeneity of treatment effects, the interpretation of the main treatment effect is controversial.

In some trials, for example some large mortality trials with very few subjects per centre, there may be no reason to expect the centres to have any influence on the primary or secondary variables because they are unlikely to represent influences of clinical importance. In other trials it may be recognized from the start that the

limited numbers of subjects per centre will make it impracticable to include the centre effects in the statistical model. In these cases it is not appropriate to include a term for centre in the model, and it is not necessary to stratify the randomization by centre in this situation.

If positive treatment effects are found in a trial with appreciable numbers of subjects per centre, there should generally be an exploration of the heterogeneity of treatment effects across centres, as this may affect the generalizability of the conclusions. Marked heterogeneity may be identified by graphical display of the results of individual centres or by analytical methods, such as a significance test of the treatment-by-centre interaction. When using such a statistical significance test, it is important to recognize that this generally has low power in a trial designed to detect the main effect of treatment.

If heterogeneity of treatment effects is found, this should be interpreted with care and vigorous attempts should be made to find an explanation in terms of other features of trial management or subject characteristics. Such an explanation will usually suggest appropriate further analysis and interpretation. In the absence of an explanation, heterogeneity of treatment effect as evidenced, for example, by marked quantitative interactions (see Glossary) implies that alternative estimates of the treatment effect may be required, giving different weights to the centres, in order to substantiate the robustness of the estimates of treatment effect. It is even more important to understand the basis of any heterogeneity characterized by marked qualitative interactions (see Glossary), and failure to find an explanation may necessitate further clinical trials before the treatment effect can be reliably predicted.

Up to this point the discussion of multicentre trials has been based on the use of fixed effect models. Mixed models may also be used to explore the heterogeneity of the treatment effect. These models consider centre and treatment-by-centre effects to be random, and are especially relevant when the number of sites is large.

3.3 Type of Comparison

3.3.1 TRIALS TO SHOW SUPERIORITY

Scientifically, efficacy is most convincingly established by demonstrating superiority to placebo in a placebo-controlled trial, by showing superiority to an active control treatment or by demonstrating a dose-response relationship. This type of trial is referred to as a 'superiority' trial (see Glossary). Generally in this guidance superiority trials are assumed, unless it is explicitly stated otherwise.

For serious illnesses, when a therapeutic treatment which has been shown to be efficacious by superiority trial(s) exists, a placebo-controlled trial may be considered unethical. In that case the scientifically sound use of an active treatment as a control should be considered. The appropriateness of placebo control vs. active control should be considered on a trial by trial basis.

3.3.2 TRIALS TO SHOW EQUIVALENCE OR NON-INFERIORITY

In some cases, an investigational product is compared to a reference treatment without the objective of showing superiority. This type of trial is divided into two

major categories according to its objective; one is an 'equivalence' trial (see Glossary) and the other is a 'non-inferiority' trial (see Glossary).

Bioequivalence trials fall into the former category. In some situations, clinical equivalence trials are also undertaken for other regulatory reasons such as demonstrating the clinical equivalence of a generic product to the marketed product when the compound is not absorbed and therefore not present in the blood stream.

Many active control trials are designed to show that the efficacy of an investigational product is no worse than that of the active comparator, and hence fall into the latter category. Another possibility is a trial in which multiple doses of the investigational drug are compared with the recommended dose or multiple doses of the standard drug. The purpose of this design is simultaneously to show a dose-response relationship for the investigational product and to compare the investigational product with the active control.

Active control equivalence or non-inferiority trials may also incorporate a placebo, thus pursuing multiple goals in one trial; for example, they may establish superiority to placebo and hence validate the trial design and simultaneously evaluate the degree of similarity of efficacy and safety to the active comparator. There are well known difficulties associated with the use of the active control equivalence (or non-inferiority) trials that do not incorporate a placebo or do not use multiple doses of the new drug. These relate to the implicit lack of any measure of internal validity (in contrast to superiority trials), thus making external validation necessary. The equivalence (or non-inferiority) trial is not conservative in nature, so that many flaws in the design or conduct of the trial will tend to bias the results towards a conclusion of equivalence. For these reasons, the design features of such trials should receive special attention and their conduct needs special care. For example, it is especially important to minimize the incidence of violations of the entry criteria, non-compliance, withdrawals, losses to follow-up, missing data and other deviations from the protocol, and also to minimize their impact on the subsequent analyses.

Active comparators should be chosen with care. An example of a suitable active comparator would be a widely used therapy whose efficacy in the relevant indication has been clearly established and quantified in well designed and well documented superiority trial(s) and which can be reliably expected to exhibit similar efficacy in the contemplated active control trial. To this end, the new trial should have the same important design features (primary variables, the dose of the active comparator, eligibility criteria, etc.) as the previously conducted superiority trials in which the active comparator clearly demonstrated clinically relevant efficacy, taking into account advances in medical or statistical practice relevant to the new trial.

It is vital that the protocol of a trial designed to demonstrate equivalence or non-inferiority contain a clear statement that this is its explicit intention. An equivalence margin should be specified in the protocol; this margin is the largest difference that can be judged as being clinically acceptable and should be smaller than differences observed in superiority trials of the active comparator. For the active control equivalence trial, both the upper and the lower equivalence margins are

needed, while only the lower margin is needed for the active control non-inferiority trial. The choice of equivalence margins should be justified clinically.

Statistical analysis is generally based on the use of confidence intervals (see Section 5.5). For equivalence trials, two-sided confidence intervals should be used. Equivalence is inferred when the entire confidence interval falls within the equivalence margins. Operationally, this is equivalent to the method of using two simultaneous one-sided tests to test the (composite) null hypothesis that the treatment difference is outside the equivalence margins versus the (composite) alternative hypothesis that the treatment difference is within the margins. Because the two null hypotheses are disjoint, the type I error is appropriately controlled. For non-inferiority trials a one-sided interval should be used. The confidence interval approach has a one-sided hypothesis test counterpart for testing the null hypothesis that the treatment difference (investigational product minus control) is equal to the lower equivalence margin versus the alternative that the treatment difference is greater than the lower equivalence margin. The choice of type I error should be a consideration separate from the use of a one-sided or two-sided procedure. Sample size calculations should be based on these methods (see Section 3.5).

Concluding equivalence or non-inferiority based on observing a non-significant test result of the null hypothesis that there is no difference between the investigational product and the active comparator is inappropriate.

There are also special issues in the choice of analysis sets. Subjects who withdraw or dropout of the treatment group or the comparator group will tend to have a lack of response, and hence the results of using the full analysis set (see Glossary) may be biased toward demonstrating equivalence (see Section 5.2.3).

3.3.3 TRIALS TO SHOW DOSE-RESPONSE RELATIONSHIP

How response is related to the dose of a new investigational product is a question to which answers may be obtained in all phases of development, and by a variety of approaches (see ICH E4). Dose-response trials may serve a number of objectives, amongst which the following are of particular importance: the confirmation of efficacy; the investigation of the shape and location of the dose-response curve; the estimation of an appropriate starting dose; the identification of optimal strategies for individual dose adjustments; the determination of a maximal dose beyond which additional benefit would be unlikely to occur. These objectives should be addressed using the data collected at a number of doses under investigation, including a placebo (zero dose) wherever appropriate. For this purpose the application of procedures to estimate the relationship between dose and response, including the construction of confidence intervals and the use of graphical methods, is as important as the use of statistical tests. The hypothesis tests that are used may need to be tailored to the natural ordering of doses or to particular questions regarding the shape of the dose-response curve (e.g. monotonicity). The details of the planned statistical procedures should be given in the protocol.

3.4 Group Sequential Designs

Group sequential designs are used to facilitate the conduct of interim analysis (see Section 4.5 and Glossary). While group sequential designs are not the only accept-

able types of designs permitting interim analysis, they are the most commonly applied because it is more practicable to assess grouped subject outcomes at periodic intervals during the trial than on a continuous basis as data from each subject become available. The statistical methods should be fully specified in advance of the availability of information on treatment outcomes and subject treatment assignments (i.e. blind breaking, see Section 4.5). An Independent Data Monitoring Committee (see Glossary) may be used to review or to conduct the interim analysis of data arising from a group sequential design (see Section 4.6). While the design has been most widely and successfully used in large, long-term trials of mortality or major non-fatal endpoints, its use is growing in other circumstances. In particular, it is recognized that safety must be monitored in all trials and therefore the need for formal procedures to cover early stopping for safety reasons should always be considered.

3.5 Sample Size

The number of subjects in a clinical trial should always be large enough to provide a reliable answer to the questions addressed. This number is usually determined by the primary objective of the trial. If the sample size is determined on some other basis, then this should be made clear and justified. For example, a trial sized on the basis of safety questions or requirements or important secondary objectives may need larger numbers of subjects than a trial sized on the basis of the primary efficacy question (see, for example, ICH E1a).

Using the usual method for determining the appropriate sample size, the following items should be specified: a primary variable, the test statistic, the null hypothesis, the alternative ('working') hypothesis at the chosen dose(s) (embodying consideration of the treatment difference to be detected or rejected at the dose and in the subject population selected), the probability of erroneously rejecting the null hypothesis (the type I error), and the probability of erroneously failing to reject the null hypothesis (the type II error), as well as the approach to dealing with treatment withdrawals and protocol violations. In some instances, the event rate is of primary interest for evaluating power, and assumptions should be made to extrapolate from the required number of events to the eventual sample size for the trial.

The method by which the sample size is calculated should be given in the protocol, together with the estimates of any quantities used in the calculations (such as variances, mean values, response rates, event rates, difference to be detected). The basis of these estimates should also be given. It is important to investigate the sensitivity of the sample size estimate to a variety of deviations from these assumptions and this may be facilitated by providing a range of sample sizes appropriate for a reasonable range of deviations from assumptions. In confirmatory trials, assumptions should normally be based on published data or on the results of earlier trials. The treatment difference to be detected may be based on a judgement concerning the minimal effect which has clinical relevance in the management of patients or on a judgement concerning the anticipated effect of the new treatment, where this is larger. Conventionally the probability of type I error is set at 5% or less or as dictated by any adjustments made necessary for multiplicity considera-

tions; the precise choice may be influenced by the prior plausibility of the hypothesis under test and the desired impact of the results. The probability of type II error is conventionally set at 10% to 20%; it is in the sponsor's interest to keep this figure as low as feasible especially in the case of trials that are difficult or impossible to repeat. Alternative values to the conventional levels of type I and type II error may be acceptable or even preferable in some cases.

Sample size calculations should refer to the number of subjects required for the primary analysis. If this is the 'full analysis set', estimates of the effect size may need to be reduced compared to the per protocol set (see Glossary). This is to allow for the dilution of the treatment effect arising from the inclusion of data from patients who have withdrawn from treatment or whose compliance is poor. The assumptions about variability may also need to be revised.

The sample size of an equivalence trial or a non-inferiority trial (see Section 3.3.2) should normally be based on the objective of obtaining a confidence interval for the treatment difference that shows that the treatments differ at most by a clinically acceptable difference. When the power of an equivalence trial is assessed at a true difference of zero, then the sample size necessary to achieve this power is underestimated if the true difference is not zero. When the power of a non-inferiority trial is assessed at a zero difference, then the sample size needed to achieve that power will be underestimated if the effect of the investigational product is less than that of the active control. The choice of a 'clinically acceptable' difference needs justification with respect to its meaning for future patients, and may be smaller than the 'clinically relevant' difference referred to above in the context of superiority trials designed to establish that a difference exists.

The exact sample size in a group sequential trial cannot be fixed in advance because it depends upon the play of chance in combination with the chosen stopping guideline and the true treatment difference. The design of the stopping guideline should take into account the consequent distribution of the sample size, usually embodied in the expected and maximum sample sizes.

When event rates are lower than anticipated or variability is larger than expected, methods for sample size re-estimation are available without unblinding data or making treatment comparisons (see Section 4.4).

3.6 Data Capture and Processing

The collection of data and transfer of data from the investigator to the sponsor can take place through a variety of media, including paper case record forms, remote site monitoring systems, medical computer systems and electronic transfer. Whatever data capture instrument is used, the form and content of the information collected should be in full accordance with the protocol and should be established in advance of the conduct of the clinical trial. It should focus on the data necessary to implement the planned analysis, including the context information (such as timing assessments relative to dosing) necessary to confirm protocol compliance or identify important protocol deviations. 'Missing values' should be distinguishable from the 'value zero' or 'characteristic absent'.

The process of data capture through to database finalization should be carried out in accordance with GCP (see ICH E6, Section 5). Specifically, timely and reliable processes for recording data and rectifying errors and omissions are necessary to ensure delivery of a quality database and the achievement of the trial objectives through the implementation of the planned analysis.

4. TRIAL CONDUCT CONSIDERATIONS

4.1 Trial Monitoring and Interim Analysis

Careful conduct of a clinical trial according to the protocol has a major impact on the credibility of the results (see ICH E6). Careful monitoring can ensure that difficulties are noticed early and their occurrence or recurrence minimized.

There are two distinct types of monitoring that generally characterize confirmatory clinical trials sponsored by the pharmaceutical industry. One type of monitoring concerns the oversight of the quality of the trial, while the other type involves breaking the blind to make treatment comparisons (i.e. interim analysis). Both types of trial monitoring, in addition to entailing different staff responsibilities, involve access to different types of trial data and information, and thus different principles apply for the control of potential statistical and operational bias.

For the purpose of overseeing the quality of the trial the checks involved in trial monitoring may include whether the protocol is being followed, the acceptability of data being accrued, the success of planned accrual targets, the appropriateness of the design assumptions, success in keeping patients in the trials, etc. (see Sections 4.2 to 4.4). This type of monitoring does not require access to information on comparative treatment effects, nor unblinding of data and therefore has no impact on type I error. The monitoring of a trial for this purpose is the responsibility of the sponsor (see ICH E6) and can be carried out by the sponsor or an independent group selected by the sponsor. The period for this type of monitoring usually starts with the selection of the trial sites and ends with the collection and cleaning of the last subject's data.

The other type of trial monitoring (interim analysis) involves the accruing of comparative treatment results. Interim analysis requires unblinded (i.e. key breaking) access to treatment group assignment (actual treatment assignment or identification of group assignment) and comparative treatment group summary information. This necessitates that the protocol (or appropriate amendments prior to a first analysis) contains statistical plans for the interim analysis to prevent certain types of bias. This is discussed in Sections 4.5 and 4.6.

4.2 Changes in Inclusion and Exclusion Criteria

Inclusion and exclusion criteria should remain constant, as specified in the protocol, throughout the period of subject recruitment. Changes may occasionally be appropriate, for example, in long term trials, where growing medical knowledge either from outside the trial or from interim analyses may suggest a change of entry criteria. Changes may also result from the discovery by monitoring staff that regular violations of the entry criteria are occurring, or that seriously low recruitment

rates are due to over-restrictive criteria. Changes should be made without breaking the blind and should always be described by a protocol amendment which should cover any statistical consequences, such as sample size adjustments arising from different event rates, or modifications to the planned analysis, such as stratifying the analysis according to modified inclusion/exclusion criteria.

4.3 Accrual Rates

In trials with a long time-scale for the accrual of subjects, the rate of accrual should be monitored and, if it falls appreciably below the projected level, the reasons should be identified and remedial actions taken in order to protect the power of the trial and alleviate concerns about selective entry and other aspects of quality. In a multicentre trial these considerations apply to the individual centres.

4.4 Sample Size Adjustment

In long term trials there will usually be an opportunity to check the assumptions which underlay the original design and sample size calculations. This may be particularly important if the trial specifications have been made on preliminary and/or uncertain information. An interim check conducted on the blinded data may reveal that overall response variances, event rates or survival experience are not as anticipated. A revised sample size may then be calculated using suitably modified assumptions, and should be justified and documented in a protocol amendment and in the clinical study report. The steps taken to preserve blindness and the consequences, if any, for the type I error and the width of confidence intervals should be explained. The potential need for re-estimation of the sample size should be envisaged in the protocol whenever possible (see Section 3.5).

4.5 Interim Analysis and Early Stopping

An interim analysis is any analysis intended to compare treatment arms with respect to efficacy or safety at any time prior to formal completion of a trial. Because the number, methods and consequences of these comparisons affect the interpretation of the trial, all interim analyses should be carefully planned in advance and described in the protocol. Special circumstances may dictate the need for an interim analysis that was not defined at the start of a trial. In these cases, a protocol amendment describing the interim analysis should be completed prior to unblinded access to treatment comparison data. When an interim analysis is planned with the intention of deciding whether or not to terminate a trial, this is usually accomplished by the use of a group sequential design which employs statistical monitoring schemes as guidelines (see Section 3.4). The goal of such an interim analysis is to stop the trial early if the superiority of the treatment under study is clearly established, if the demonstration of a relevant treatment difference has become unlikely or if unacceptable adverse effects are apparent. Generally, boundaries for monitoring efficacy require more evidence to terminate a trial early (i.e. they are more conservative) than boundaries for monitoring safety. When the trial design and monitoring objective involve multiple endpoints then this aspect of multiplicity may also need to be taken into account.

The protocol should describe the schedule of interim analyses, or at least the considerations which will govern its generation, for example if flexible alpha spending function approaches are to be employed; further details may be given in a protocol amendment before the time of the first interim analysis. The stopping guidelines and their properties should be clearly described in the protocol or amendments. The potential effects of early stopping on the analysis of other important variables should also be considered. This material should be written or approved by the Data Monitoring Committee (see Section 4.6), when the trial has one. Deviations from the planned procedure always bear the potential of invalidating the trial results. If it becomes necessary to make changes to the trial, any consequent changes to the statistical procedures should be specified in an amendment to the protocol at the earliest opportunity, especially discussing the impact on any analysis and inferences that such changes may cause. The procedures selected should always ensure that the overall probability of type I error is controlled.

The execution of an interim analysis should be a completely confidential process because unblinded data and results are potentially involved. All staff involved in the conduct of the trial should remain blind to the results of such analyses, because of the possibility that their attitudes to the trial will be modified and cause changes in the characteristics of patients to be recruited or biases in treatment comparisons. This principle may be applied to all investigator staff and to staff employed by the sponsor except for those who are directly involved in the execution of the interim analysis. Investigators should only be informed about the decision to continue or to discontinue the trial, or to implement modifications to trial procedures.

Most clinical trials intended to support the efficacy and safety of an investigational product should proceed to full completion of planned sample size accrual; trials should be stopped early only for ethical reasons or if the power is no longer acceptable. However, it is recognized that drug development plans involve the need for sponsor access to comparative treatment data for a variety of reasons, such as planning other trials. It is also recognized that only a subset of trials will involve the study of serious life-threatening outcomes or mortality which may need sequential monitoring of accruing comparative treatment effects for ethical reasons. In either of these situations, plans for interim statistical analysis should be in place in the protocol or in protocol amendments prior to the unblinded access to comparative treatment data in order to deal with the potential statistical and operational bias that may be introduced.

For many clinical trials of investigational products, especially those that have major public health significance, the responsibility for monitoring comparisons of efficacy and/or safety outcomes should be assigned to an external independent group, often called an Independent Data Monitoring Committee (IDMC), a Data and Safety Monitoring Board or a Data Monitoring Committee whose responsibilities should be clearly described.

When a sponsor assumes the role of monitoring efficacy or safety comparisons and therefore has access to unblinded comparative information, particular care should be taken to protect the integrity of the trial and to manage and limit appropriately the sharing of information. The sponsor should assure and document that the

internal monitoring committee has complied with written standard operating procedures and that minutes of decision making meetings including records of interim results are maintained.

Any interim analysis that is not planned appropriately (with or without the consequences of stopping the trial early) may flaw the results of a trial and possibly weaken confidence in the conclusions drawn. Therefore, such analyses should be avoided. If unplanned interim analysis is conducted, the clinical study report should explain why it was necessary, the degree to which blindness had to be broken, provide an assessment of the potential magnitude of bias introduced, and the impact on the interpretation of the results.

4.6 Role of Independent Data Monitoring Committee (IDMC) (see Sections 1.25 and 5.52 of ICH E6)

An IDMC may be established by the sponsor to assess at intervals the progress of a clinical trial, safety data, and critical efficacy variables and recommend to the sponsor whether to continue, modify or terminate a trial. The IDMC should have written operating procedures and maintain records of all its meetings, including interim results; these should be available for review when the trial is complete. The independence of the IDMC is intended to control the sharing of important comparative information and to protect the integrity of the clinical trial from adverse impact resulting from access to trial information. The IDMC is a separate entity from an Institutional Review Board (IRB) or an Independent Ethics Committee (IEC), and its composition should include clinical trial scientists knowledgeable in the appropriate disciplines including statistics.

When there are sponsor representatives on the IDMC, their role should be clearly defined in the operating procedures of the committee (for example, covering whether or not they can vote on key issues). Since these sponsor staff would have access to unblinded information, the procedures should also address the control of dissemination of interim trial results within the sponsor organization.

5. DATA ANALYSIS CONSIDERATIONS

5.1 Prespecification of the Analysis

When designing a clinical trial the principal features of the eventual statistical analysis of the data should be described in the statistical section of the protocol. This section should include all the principal features of the proposed confirmatory analysis of the primary variable(s) and the way in which anticipated analysis problems will be handled. In case of exploratory trials this section could describe more general principles and directions.

The statistical analysis plan (see Glossary) may be written as a separate document to be completed after finalising the protocol. In this document, a more technical and detailed elaboration of the principal features stated in the protocol may be included (see Section 7.1). The plan may include detailed procedures for executing the statistical analysis of the primary and secondary variables and other data. The plan should be reviewed and possibly updated as a result of the blind review of the

data (see 7.1 for definition) and should be finalized before breaking the blind. Formal records should be kept of when the statistical analysis plan was finalized as well as when the blind was subsequently broken.

If the blind review suggests changes to the principal features stated in the protocol, these should be documented in a protocol amendment. Otherwise, it will suffice to update the statistical analysis plan with the considerations suggested from the blind review. Only results from analyses envisaged in the protocol (including amendments) can be regarded as confirmatory.

In the statistical section of the clinical study report the statistical methodology should be clearly described including when in the clinical trial process methodology decisions were made (see ICH E3).

5.2 Analysis Sets

The set of subjects whose data are to be included in the main analyses should be defined in the statistical section of the protocol. In addition, documentation for all subjects for whom trial procedures (e.g. run-in period) were initiated may be useful. The content of this subject documentation depends on detailed features of the particular trial, but at least demographic and baseline data on disease status should be collected whenever possible.

If all subjects randomized into a clinical trial satisfied all entry criteria, followed all trial procedures perfectly with no losses to follow-up, and provided complete data records, then the set of subjects to be included in the analysis would be self-evident. The design and conduct of a trial should aim to approach this ideal as closely as possible, but, in practice, it is doubtful if it can ever be fully achieved. Hence, the statistical section of the protocol should address anticipated problems prospectively in terms of how these affect the subjects and data to be analysed. The protocol should also specify procedures aimed at minimizing any anticipated irregularities in study conduct that might impair a satisfactory analysis, including various types of protocol violations, withdrawals and missing values. The protocol should consider ways both to reduce the frequency of such problems, and also to handle the problems that do occur in the analysis of data. Possible amendments to the way in which the analysis will deal with protocol violations should be identified during the blind review. It is desirable to identify any important protocol violation with respect to the time when it occurred, its cause and influence on the trial result. The frequency and type of protocol violations, missing values, and other problems should be documented in the clinical study report and their potential influence on the trial results should be described (see ICH E3).

Decisions concerning the analysis set should be guided by the following principles: 1) to minimize bias, and 2) to avoid inflation of type I error.

5.2.1 FULL ANALYSIS SET

The intention-to-treat (see Glossary) principle implies that the primary analysis should include all randomized subjects. Compliance with this principle would necessitate complete follow-up of all randomized subjects for study outcomes. In practice this ideal may be difficult to achieve, for rea-

sons to be described. In this document the term 'full analysis set' is used to describe the analysis set which is as complete as possible and as close as possible to the intention-to-treat ideal of including all randomized subjects. Preservation of the initial randomization in analysis is important in preventing bias and in providing a secure foundation for statistical tests. In many clinical trials the use of the full analysis set provides a conservative strategy. Under many circumstances it may also provide estimates of treatment effects which are more likely to mirror those observed in subsequent practice.

There are a limited number of circumstances that might lead to excluding randomized subjects from the full analysis set including the failure to satisfy major entry criteria (eligibility violations), the failure to take at least one dose of trial medication and the lack of any data post randomization. Such exclusions should always be justified. Subjects who fail to satisfy an entry criterion may be excluded from the analysis without the possibility of introducing bias only under the following circumstances:

(i) the entry criterion was measured prior to randomization;

(ii) the detection of the relevant eligibility violations can be made completely objectively;

(iii) all subjects receive equal scrutiny for eligibility violations; (This may be difficult to ensure in an open-label study, or even in a double-blind study if the data are unblinded prior to this scrutiny, emphasising the importance of the blind review.)

(iv) all detected violations of the particular entry criterion are excluded.

In some situations, it may be reasonable to eliminate from the set of all randomized subjects any subject who took no trial medication. The intention-to-treat principle would be preserved despite the exclusion of these patients provided, for example, that the decision of whether or not to begin treatment could not be influenced by knowledge of the assigned treatment. In other situations it may be necessary to eliminate from the set of all randomized subjects any subject without data post randomization. No analysis is complete unless the potential biases arising from these specific exclusions, or any others, are addressed.

When the full analysis set of subjects is used, violations of the protocol that occur after randomization may have an impact on the data and conclusions, particularly if their occurrence is related to treatment assignment. In most respects it is appropriate to include the data from such subjects in the analysis, consistent with the intention-to-treat principle. Special problems arise in connection with subjects withdrawn from treatment after receiving one or more doses who provide no data after this point, and subjects otherwise lost to follow-up, because failure to include these subjects in the full analysis set may seriously undermine the approach. Measurements of primary variables made at the time of the loss to follow-up of a subject for any reason, or subsequently collected in

accordance with the intended schedule of assessments in the protocol, are valuable in this context; subsequent collection is especially important in studies where the primary variable is mortality or serious morbidity. The intention to collect data in this way should be described in the protocol. Imputation techniques, ranging from the carrying forward of the last observation to the use of complex mathematical models, may also be used in an attempt to compensate for missing data. Other methods employed to ensure the availability of measurements of primary variables for every subject in the full analysis set may require some assumptions about the subjects' outcomes or a simpler choice of outcome (e.g. success/failure). The use of any of these strategies should be described and justified in the statistical section of the protocol and the assumptions underlying any mathematical models employed should be clearly explained. It is also important to demonstrate the robustness of the corresponding results of analysis especially when the strategy in question could itself lead to biased estimates of treatment effects.

Because of the unpredictability of some problems, it may sometimes be preferable to defer detailed consideration of the manner of dealing with irregularities until the blind review of the data at the end of the trial, and, if so, this should be stated in the protocol.

5.2.2 PER PROTOCOL SET

The 'per protocol' set of subjects, sometimes described as the 'valid cases', the 'efficacy' sample or the 'evaluable subjects' sample, defines a subset of the subjects in the full analysis set who are more compliant with the protocol and is characterized by criteria such as the following:

(i) the completion of a certain pre-specified minimal exposure to the treatment regimen;

(ii) the availability of measurements of the primary variable(s);

(iii) the absence of any major protocol violations including the violation of entry criteria.

The precise reasons for excluding subjects from the per protocol set should be fully defined and documented before breaking the blind in a manner appropriate to the circumstances of the specific trial.

The use of the per protocol set may maximize the opportunity for a new treatment to show additional efficacy in the analysis, and most closely reflects the scientific model underlying the protocol. However, the corresponding test of the hypothesis and estimate of the treatment effect may or may not be conservative depending on the trial; the bias, which may be severe, arises from the fact that adherence to the study protocol may be related to treatment and outcome.

The problems that lead to the exclusion of subjects to create the per protocol set, and other protocol violations, should be fully identified and summarized. Relevant protocol violations may include errors in treatment

assignment, the use of excluded medication, poor compliance, loss to follow-up and missing data. It is good practice to assess the pattern of such problems among the treatment groups with respect to frequency and time to occurrence.

5.2.3 ROLES OF THE DIFFERENT ANALYSIS SETS

In general, it is advantageous to demonstrate a lack of sensitivity of the principal trial results to alternative choices of the set of subjects analysed. In confirmatory trials it is usually appropriate to plan to conduct both an analysis of the full analysis set and a per protocol analysis, so that any differences between them can be the subject of explicit discussion and interpretation. In some cases, it may be desirable to plan further exploration of the sensitivity of conclusions to the choice of the set of subjects analysed. When the full analysis set and the per protocol set lead to essentially the same conclusions, confidence in the trial results is increased, bearing in mind, however, that the need to exclude a substantial proportion of subjects from the per protocol analysis throws some doubt on the overall validity of the trial.

The full analysis set and the per protocol set play different roles in superiority trials (which seek to show the investigational product to be superior), and in equivalence or non-inferiority trials (which seek to show the investigational product to be comparable, see Section 3.3.2). In superiority trials the full analysis set is used in the primary analysis (apart from exceptional circumstances) because it tends to avoid over-optimistic estimates of efficacy resulting from a per protocol analysis, since the non-compliers included in the full analysis set will generally diminish the estimated treatment effect. However, in an equivalence or non-inferiority trial use of the full analysis set is generally not conservative and its role should be considered very carefully.

5.3 Missing Values and Outliers

Missing values represent a potential source of bias in a clinical trial. Hence, every effort should be undertaken to fulfil all the requirements of the protocol concerning the collection and management of data. In reality, however, there will almost always be some missing data. A trial may be regarded as valid, nonetheless, provided the methods of dealing with missing values are sensible, and particularly if those methods are pre-defined in the protocol. Definition of methods may be refined by updating this aspect in the statistical analysis plan during the blind review. Unfortunately, no universally applicable methods of handling missing values can be recommended. An investigation should be made concerning the sensitivity of the results of analysis to the method of handling missing values, especially if the number of missing values is substantial.

A similar approach should be adopted to exploring the influence of outliers, the statistical definition of which is, to some extent, arbitrary. Clear identification of a particular value as an outlier is most convincing when justified medically as well as

statistically, and the medical context will then often define the appropriate action. Any outlier procedure set out in the protocol or the statistical analysis plan should be such as not to favour any treatment group a priori. Once again, this aspect of the analysis can be usefully updated during blind review. If no procedure for dealing with outliers was foreseen in the trial protocol, one analysis with the actual values and at least one other analysis eliminating or reducing the outlier effect should be performed and differences between their results discussed.

5.4 Data Transformation

The decision to transform key variables prior to analysis is best made during the design of the trial on the basis of similar data from earlier clinical trials. Transformations (e.g. square root, logarithm) should be specified in the protocol and a rationale provided, especially for the primary variable(s). The general principles guiding the use of transformations to ensure that the assumptions underlying the statistical methods are met are to be found in standard texts; conventions for particular variables have been developed in a number of specific clinical areas. The decision on whether and how to transform a variable should be influenced by the preference for a scale which facilitates clinical interpretation.

Similar considerations apply to other derived variables, such as the use of change from baseline, percentage change from baseline, the 'area under the curve' of repeated measures, or the ratio of two different variables. Subsequent clinical interpretation should be carefully considered, and the derivation should be justified in the protocol. Closely related points are made in Section 2.2.2.

5.5 Estimation, Confidence Intervals and Hypothesis Testing

The statistical section of the protocol should specify the hypotheses that are to be tested and/or the treatment effects which are to be estimated in order to satisfy the primary objectives of the trial. The statistical methods to be used to accomplish these tasks should be described for the primary (and preferably the secondary) variables, and the underlying statistical model should be made clear. Estimates of treatment effects should be accompanied by confidence intervals, whenever possible, and the way in which these will be calculated should be identified. A description should be given of any intentions to use baseline data to improve precision or to adjust estimates for potential baseline differences, for example by means of analysis of covariance.

It is important to clarify whether one- or two-sided tests of statistical significance will be used, and in particular to justify prospectively the use of one-sided tests. If hypothesis tests are not considered appropriate, then the alternative process for arriving at statistical conclusions should be given. The issue of one-sided or two-sided approaches to inference is controversial and a diversity of views can be found in the statistical literature. The approach of setting type I errors for one-sided tests at half the conventional type I error used in two-sided tests is preferable in regulatory settings. This promotes consistency with the two-sided confidence intervals that are generally appropriate for estimating the possible size of the difference between two treatments.

The particular statistical model chosen should reflect the current state of medical and statistical knowledge about the variables to be analysed as well as the statistical design of the trial. All effects to be fitted in the analysis (for example in analysis of variance models) should be fully specified, and the manner, if any, in which this set of effects might be modified in response to preliminary results should be explained. The same considerations apply to the set of covariates fitted in an analysis of covariance. (See also Section 5.7.). In the choice of statistical methods due attention should be paid to the statistical distribution of both primary and secondary variables. When making this choice (for example between parametric and non-parametric methods) it is important to bear in mind the need to provide statistical estimates of the size of treatment effects together with confidence intervals (in addition to significance tests).

The primary analysis of the primary variable should be clearly distinguished from supporting analyses of the primary or secondary variables. Within the statistical section of the protocol or the statistical analysis plan there should also be an outline of the way in which data other than the primary and secondary variables will be summarized and reported. This should include a reference to any approaches adopted for the purpose of achieving consistency of analysis across a range of trials, for example for safety data.

Modelling approaches that incorporate information on known pharmacological parameters, the extent of protocol compliance for individual subjects or other biologically based data may provide valuable insights into actual or potential efficacy, especially with regard to estimation of treatment effects. The assumptions underlying such models should always be clearly identified, and the limitations of any conclusions should be carefully described.

5.6 Adjustment of Significance and Confidence Levels

When multiplicity is present, the usual frequentist approach to the analysis of clinical trial data may necessitate an adjustment to the type I error. Multiplicity may arise, for example, from multiple primary variables (see Section 2.2.2), multiple comparisons of treatments, repeated evaluation over time and/or interim analyses (see Section 4.5). Methods to avoid or reduce multiplicity are sometimes preferable when available, such as the identification of the key primary variable (multiple variables), the choice of a critical treatment contrast (multiple comparisons), the use of a summary measure such as 'area under the curve' (repeated measures). In confirmatory analyses, any aspects of multiplicity which remain after steps of this kind have been taken should be identified in the protocol; adjustment should always be considered and the details of any adjustment procedure or an explanation of why adjustment is not thought to be necessary should be set out in the analysis plan.

5.7 Subgroups, Interactions and Covariates

The primary variable(s) is often systematically related to other influences apart from treatment. For example, there may be relationships to covariates such as age and sex, or there may be differences between specific subgroups of subjects such as those treated at the different centres of a multicentre trial. In some instances

an adjustment for the influence of covariates or for subgroup effects is an integral part of the planned analysis and hence should be set out in the protocol. Pre-trial deliberations should identify those covariates and factors expected to have an important influence on the primary variable(s), and should consider how to account for these in the analysis in order to improve precision and to compensate for any lack of balance between treatment groups. If one or more factors are used to stratify the design, it is appropriate to account for those factors in the analysis. When the potential value of an adjustment is in doubt, it is often advisable to nominate the unadjusted analysis as the one for primary attention, the adjusted analysis being supportive. Special attention should be paid to centre effects and to the role of baseline measurements of the primary variable. It is not advisable to adjust the main analyses for covariates measured after randomization because they may be affected by the treatments.

The treatment effect itself may also vary with subgroup or covariate – for example, the effect may decrease with age or may be larger in a particular diagnostic category of subjects. In some cases such interactions are anticipated or are of particular prior interest (e.g. geriatrics), and hence a subgroup analysis, or a statistical model including interactions, is part of the planned confirmatory analysis. In most cases, however, subgroup or interaction analyses are exploratory and should be clearly identified as such; they should explore the uniformity of any treatment effects found overall. In general, such analyses should proceed first through the addition of interaction terms to the statistical model in question, complemented by additional exploratory analysis within relevant subgroups of subjects, or within strata defined by the covariates. When exploratory, these analyses should be interpreted cautiously; any conclusion of treatment efficacy (or lack thereof) or safety based solely on exploratory subgroup analyses are unlikely to be accepted.

5.8 Integrity of Data and Computer Software Validity

The credibility of the numerical results of the analysis depends on the quality and validity of the methods and software (both internally and externally written) used both for data management (data entry, storage, verification, correction and retrieval) and also for processing the data statistically. Data management activities should therefore be based on thorough and effective standard operating procedures. The computer software used for data management and statistical analysis should be reliable, and documentation of appropriate software testing procedures should be available.

6. EVALUATION OF SAFETY AND TOLERABILITY

6.1 Scope of Evaluation

In all clinical trials evaluation of safety and tolerability (see Glossary) constitutes an important element. In early phases this evaluation is mostly of an exploratory nature, and is only sensitive to frank expressions of toxicity, whereas in later phases the establishment of the safety and tolerability profile of a drug can be characterized more fully in larger samples of subjects. Later phase controlled trials represent

an important means of exploring in an unbiased manner any new potential adverse effects, even if such trials generally lack power in this respect.

Certain trials may be designed with the purpose of making specific claims about superiority or equivalence with regard to safety and tolerability compared to another drug or to another dose of the investigational drug. Such specific claims should be supported by relevant evidence from confirmatory trials, similar to that necessary for corresponding efficacy claims.

6.2 Choice of Variables and Data Collection

In any clinical trial the methods and measurements chosen to evaluate the safety and tolerability of a drug will depend on a number of factors, including knowledge of the adverse effects of closely related drugs, information from non-clinical and earlier clinical trials and possible consequences of the pharmacodynamic/pharmacokinetic properties of the particular drug, the mode of administration, the type of subjects to be studied, and the duration of the trial. Laboratory tests concerning clinical chemistry and haematology, vital signs, and clinical adverse events (diseases, signs and symptoms) usually form the main body of the safety and tolerability data. The occurrence of serious adverse events and treatment discontinuations due to adverse events are particularly important to register (see ICH E2A and ICH E3).

Furthermore, it is recommended that a consistent methodology be used for the data collection and evaluation throughout a clinical trial program in order to facilitate the combining of data from different trials. The use of a common adverse event dictionary is particularly important. This dictionary has a structure which gives the possibility to summarize the adverse event data on three different levels; system-organ class, preferred term or included term (see Glossary). The preferred term is the level on which adverse events usually are summarized, and preferred terms belonging to the same system-organ class could then be brought together in the descriptive presentation of data (see ICH M1).

6.3 Set of Subjects to be Evaluated and Presentation of Data

For the overall safety and tolerability assessment, the set of subjects to be summarized is usually defined as those subjects who received at least one dose of the investigational drug. Safety and tolerability variables should be collected as comprehensively as possible from these subjects, including type of adverse event, severity, onset and duration (see ICH E2B). Additional safety and tolerability evaluations may be needed in specific subpopulations, such as females, the elderly (see ICH E7), the severely ill, or those who have a common concomitant treatment. These evaluations may need to address more specific issues (see ICH E3).

All safety and tolerability variables will need attention during evaluation, and the broad approach should be indicated in the protocol. All adverse events should be reported, whether or not they are considered to be related to treatment. All available data in the study population should be accounted for in the evaluation. Definitions of measurement units and reference ranges of laboratory variables

should be made with care; if different units or different reference ranges appear in the same trial (e.g. if more than one laboratory is involved), then measurements should be appropriately standardized to allow a unified evaluation. Use of a toxicity grading scale should be prespecified and justified.

The incidence of a certain adverse event is usually expressed in the form of a proportion relating number of subjects experiencing events to number of subjects at risk. However, it is not always self-evident how to assess incidence. For example, depending on the situation the number of exposed subjects or the extent of exposure (in person-years) could be considered for the denominator. Whether the purpose of the calculation is to estimate a risk or to make a comparison between treatment groups it is important that the definition is given in the protocol. This is especially important if long-term treatment is planned and a substantial proportion of treatment withdrawals or deaths are expected. For such situations survival analysis methods should be considered and cumulative adverse event rates calculated in order to avoid the risk of underestimation.

In situations when there is a substantial background noise of signs and symptoms (e.g. in psychiatric trials) one should consider ways of accounting for this in the estimation of risk for different adverse events. One such method is to make use of the 'treatment emergent' (see Glossary) concept in which adverse events are recorded only if they emerge or worsen relative to pretreatment baseline.

Other methods to reduce the effect of the background noise may also be appropriate such as ignoring adverse events of mild severity or requiring that an event should have been observed at repeated visits to qualify for inclusion in the numerator. Such methods should be explained and justified in the protocol.

6.4 Statistical Evaluation

The investigation of safety and tolerability is a multidimensional problem. Although some specific adverse effects can usually be anticipated and specifically monitored for any drug, the range of possible adverse effects is very large, and new and unforeseeable effects are always possible. Further, an adverse event experienced after a protocol violation, such as use of an excluded medication, may introduce a bias. This background underlies the statistical difficulties associated with the analytical evaluation of safety and tolerability of drugs, and means that conclusive information from confirmatory clinical trials is the exception rather than the rule.

In most trials the safety and tolerability implications are best addressed by applying descriptive statistical methods to the data, supplemented by calculation of confidence intervals wherever this aids interpretation. It is also valuable to make use of graphical presentations in which patterns of adverse events are displayed both within treatment groups and within subjects.

The calculation of p-values is sometimes useful either as an aid to evaluating a specific difference of interest, or as a 'flagging' device applied to a large number of safety and tolerability variables to highlight differences worth further attention. This is particularly useful for laboratory data, which otherwise can be difficult to summarize appropriately. It is recommended that laboratory data be subjected to both a quantitative analysis, e.g. evaluation of treatment means, and a qualitative

analysis where counting of numbers above or below certain thresholds are calculated.

If hypothesis tests are used, statistical adjustments for multiplicity to quantify the type I error are appropriate, but the type II error is usually of more concern. Care should be taken when interpreting putative statistically significant findings when there is no multiplicity adjustment.

In the majority of trials investigators are seeking to establish that there are no clinically unacceptable differences in safety and tolerability compared with either a comparator drug or a placebo. As is the case for non-inferiority or equivalence evaluation of efficacy the use of confidence intervals is preferred to hypothesis testing in this situation. In this way, the considerable imprecision often arising from low frequencies of occurrence is clearly demonstrated.

6.5 Integrated Summary

The safety and tolerability properties of a drug are commonly summarized across trials continuously during an investigational product's development and in particular at the time of a marketing application. The usefulness of this summary, however, is dependent on adequate and well-controlled individual trials with high data quality.

The overall usefulness of a drug is always a question of balance between risk and benefit and in a single trial such a perspective could also be considered, even if the assessment of risk/benefit usually is performed in the summary of the entire clinical trial program. (See Section 7.2.2)

For more details on the reporting of safety and tolerability, see Chapter 12 of ICH E3.

7. REPORTING

7.1 Evaluation and Reporting

As stated in the Introduction, the structure and content of clinical study reports is the subject of ICH E3. That ICH guidance fully covers the reporting of statistical work, appropriately integrated with clinical and other material. The current section is therefore relatively brief.

During the planning phase of a trial the principal features of the analysis should have been specified in the protocol as described in Section 5. When the conduct of the trial is over and the data are assembled and available for preliminary inspection, it is valuable to carry out the blind review of the planned analysis also described in Section 5. This pre-analysis review, blinded to treatment, should cover decisions concerning, for example, the exclusion of subjects or data from the analysis sets; possible transformations may also be checked, and outliers defined; important covariates identified in other recent research may be added to the model; the use of parametric or non-parametric methods may be reconsidered. Decisions made at this time should be described in the report, and should be distinguished from those made after the statistician has had access to the treatment codes, as blind decisions will generally introduce less potential for bias. Statisticians or other

staff involved in unblinded interim analysis should not participate in the blind review or in making modifications to the statistical analysis plan. When the blinding is compromised by the possibility that treatment induced effects may be apparent in the data, special care will be needed for the blind review.

Many of the more detailed aspects of presentation and tabulation should be finalized at or about the time of the blind review so that by the time of the actual analysis full plans exist for all its aspects including subject selection, data selection and modification, data summary and tabulation, estimation and hypothesis testing. Once data validation is complete, the analysis should proceed according to the pre-defined plans; the more these plans are adhered to, the greater the credibility of the results. Particular attention should be paid to any differences between the planned analysis and the actual analysis as described in the protocol, protocol amendments or the updated statistical analysis plan based on a blind review of data. A careful explanation should be provided for deviations from the planned analysis.

All subjects who entered the trial should be accounted for in the report, whether or not they are included in the analysis. All reasons for exclusion from analysis should be documented; for any subject included in the full analysis set but not in the per protocol set, the reasons for exclusion from the latter should also be documented. Similarly, for all subjects included in an analysis set, the measurements of all important variables should be accounted for at all relevant time-points.

The effect of all losses of subjects or data, withdrawals from treatment and major protocol violations on the main analyses of the primary variable(s) should be considered carefully. Subjects lost to follow up, withdrawn from treatment, or with a severe protocol violation should be identified, and a descriptive analysis of them provided, including the reasons for their loss and its relationship to treatment and outcome.

Descriptive statistics form an indispensable part of reports. Suitable tables and/or graphical presentations should illustrate clearly the important features of the primary and secondary variables and of key prognostic and demographic variables. The results of the main analyses relating to the objectives of the trial should be the subject of particularly careful descriptive presentation. When reporting the results of significance tests, precise p-values (e.g. 'p = 0.034') should be reported rather than making exclusive reference to critical values.

Although the primary goal of the analysis of a clinical trial should be to answer the questions posed by its main objectives, new questions based on the observed data may well emerge during the unblinded analysis. Additional and perhaps complex statistical analysis may be the consequence. This additional work should be strictly distinguished in the report from work which was planned in the protocol.

The play of chance may lead to unforeseen imbalances between the treatment groups in terms of baseline measurements not pre-defined as covariates in the planned analysis but having some prognostic importance nevertheless. This is best dealt with by showing that an additional analysis which accounts for these imbalances reaches essentially the same conclusions as the planned analysis. If this is not the case, the effect of the imbalances on the conclusions should be discussed.

In general, sparing use should be made of unplanned analyses. Such analyses are often carried out when it is thought that the treatment effect may vary according to some other factor or factors. An attempt may then be made to identify subgroups of subjects for whom the effect is particularly beneficial. The potential dangers of over-interpretation of unplanned subgroup analyses are well known (see also Section 5.7), and should be carefully avoided. Although similar problems of interpretation arise if a treatment appears to have no benefit, or an adverse effect, in a subgroup of subjects, such possibilities should be properly assessed and should therefore be reported.

Finally statistical judgement should be brought to bear on the analysis, interpretation and presentation of the results of a clinical trial. To this end the trial statistician should be a member of the team responsible for the clinical study report, and should approve the clinical report.

7.2 Summarizing the Clinical Database

An overall summary and synthesis of the evidence on safety and efficacy from all the reported clinical trials is required for a marketing application (Expert report in EU, integrated summary reports in USA, Gaiyo in Japan). This may be accompanied, when appropriate, by a statistical combination of results.

Within the summary a number of areas of specific statistical interest arise: describing the demography and clinical features of the population treated during the course of the clinical trial programme; addressing the key questions of efficacy by considering the results of the relevant (usually controlled) trials and highlighting the degree to which they reinforce or contradict each other; summarising the safety information available from the combined database of all the trials whose results contribute to the marketing application and identifying potential safety issues. During the design of a clinical programme careful attention should be paid to the uniform definition and collection of measurements which will facilitate subsequent interpretation of the series of trials, particularly if they are likely to be combined across trials. A common dictionary for recording the details of medication, medical history and adverse events should be selected and used. A common definition of the primary and secondary variables is nearly always worthwhile, and essential for meta-analysis. The manner of measuring key efficacy variables, the timing of assessments relative to randomization/entry, the handling of protocol violators and deviators and perhaps the definition of prognostic factors, should all be kept compatible unless there are valid reasons not to do so.

Any statistical procedures used to combine data across trials should be described in detail. Attention should be paid to the possibility of bias associated with the selection of trials, to the homogeneity of their results, and to the proper modelling of the various sources of variation. The sensitivity of conclusions to the assumptions and selections made should be explored.

7.2.1 EFFICACY DATA

Individual clinical trials should always be large enough to satisfy their objectives. Additional valuable information may also be gained by summarising a series of clin-

ical trials which address essentially identical key efficacy questions. The main results of such a set of trials should be presented in an identical form to permit comparison, usually in tables or graphs which focus on estimates plus confidence limits. The use of meta-analytic techniques to combine these estimates is often a useful addition, because it allows a more precise overall estimate of the size of the treatment effects to be generated, and provides a complete and concise summary of the results of the trials. Under exceptional circumstances a meta analytic approach may also be the most appropriate way, or the only way, of providing sufficient overall evidence of efficacy via an overall hypothesis test. When used for this purpose the meta-analysis should have its own prospectively written protocol.

7.2.2 SAFETY DATA

In summarizing safety data it is important to examine the safety database thoroughly for any indications of potential toxicity, and to follow up any indications by looking for an associated supportive pattern of observations. The combination of the safety data from all human exposure to the drug provides an important source of information, because its larger sample size provides the best chance of detecting the rarer adverse events and, perhaps, of estimating their approximate incidence. However, incidence data from this database are difficult to evaluate because of the lack of a comparator group, and data from comparative trials are especially valuable in overcoming this difficulty. The results from trials which use a common comparator (placebo or specific active comparator) should be combined and presented separately for each comparator providing sufficient data.

All indications of potential toxicity arising from exploration of the data should be reported. The evaluation of the reality of these potential adverse effects should take account of the issue of multiplicity arising from the numerous comparisons made. The evaluation should also make appropriate use of survival analysis methods to exploit the potential relationship of the incidence of adverse events to duration of exposure and/or follow-up. The risks associated with identified adverse effects should be appropriately quantified to allow a proper assessment of the risk/benefit relationship.

GLOSSARY

Bayesian Approaches
Approaches to data analysis that provide a posterior probability distribution for some parameter (e.g. treatment effect), derived from the observed data and a prior probability distribution for the parameter. The posterior distribution is then used as the basis for statistical inference.

Bias (Statistical & Operational)
The systematic tendency of any factors associated with the design, conduct, analysis and evaluation of the results of a clinical trial to make the estimate of a treatment effect deviate from its true value. Bias introduced through deviations in conduct is referred to as 'operational' bias. The other sources of bias listed above are referred to as 'statistical'.

Blind Review
The checking and assessment of data during the period of time between trial completion (the last observation on the last subject) and the breaking of the blind, for the purpose of finalizing the planned analysis.

Content Validity
The extent to which a variable (e.g. a rating scale) measures what it is supposed to measure.

Double-Dummy
A technique for retaining the blind when administering supplies in a clinical trial, when the two treatments cannot be made identical. Supplies are prepared for Treatment A (active and indistinguishable placebo) and for Treatment B (active and indistinguishable placebo). Subjects then take two sets of treatment; either A (active) and B (placebo), or A (placebo) and B (active).

Dropout
A subject in a clinical trial who for any reason fails to continue in the trial until the last visit required of him/her by the study protocol.

Equivalence Trial
A trial with the primary objective of showing that the response to two or more treatments differs by an amount which is clinically unimportant. This is usually demonstrated by showing that the true treatment difference is likely to lie between a lower and an upper equivalence margin of clinically acceptable differences.

Frequentist Methods
Statistical methods, such as significance tests and confidence intervals, which can be interpreted in terms of the frequency of certain outcomes occurring in hypothetical repeated realizations of the same experimental situation.

Full Analysis Set
The set of subjects that is as close as possible to the ideal implied by the intention-to-treat principle. It is derived from the set of all randomized subjects by minimal and justified elimination of subjects.

Generalizability, Generalization
The extent to which the findings of a clinical trial can be reliably extrapolated from the subjects who participated in the trial to a broader patient population and a broader range of clinical settings.

Global Assessment Variable
A single variable, usually a scale of ordered categorical ratings, which integrates objective variables and the investigator's overall impression about the state or change in state of a subject.

Independent Data Monitoring Committee (IDMC) (Data and Safety Monitoring Board, Monitoring Committee, Data Monitoring Committee)
An independent data-monitoring committee that may be established by the sponsor to assess at intervals the progress of a clinical trial, the safety data, and the critical efficacy endpoints, and to recommend to the sponsor whether to continue, modify, or stop a trial.

Intention-To-Treat Principle
The principle that asserts that the effect of a treatment policy can be best assessed by evaluating on the basis of the intention to treat a subject (i.e. the planned treatment regimen) rather than the actual treatment given. It has the consequence that subjects allocated to a treatment group should be followed up, assessed and analysed as members of that group irrespective of their compliance to the planned course of treatment.

Interaction (Qualitative & Quantitative)
The situation in which a treatment contrast (e.g. difference between investigational product and control) is dependent on another factor (e.g. centre). A quantitative interaction refers to the case where the magnitude of the contrast differs at the different levels of the factor, whereas for a qualitative interaction the direction of the contrast differs for at least one level of the factor.

Inter-Rater Reliability
The property of yielding equivalent results when used by different raters on different occasions.

Intra-Rater Reliability
The property of yielding equivalent results when used by the same rater on different occasions.

Interim Analysis
Any analysis intended to compare treatment arms with respect to efficacy or safety at any time prior to the formal completion of a trial.

Meta-Analysis
The formal evaluation of the quantitative evidence from two or more trials bearing on the same question. This most commonly involves the statistical combination of summary statistics from the various trials, but the term is sometimes also used to refer to the combination of the raw data.

Multicentre Trial
A clinical trial conducted according to a single protocol but at more than one site, and therefore, carried out by more than one investigator.

Non-Inferiority Trial
A trial with the primary objective of showing that the response to the investigational product is not clinically inferior to a comparative agent (active or placebo control).

Preferred and Included Terms
In a hierarchical medical dictionary, for example MedDRA, the included term is the lowest level of dictionary term to which the investigator description is coded. The preferred term is the level of grouping of included terms typically used in reporting frequency of occurrence. For example, the investigator text "Pain in the left arm" might be coded to the included term "Joint pain", which is reported at the preferred term level as "Arthralgia".

Per Protocol Set (Valid Cases, Efficacy Sample, Evaluable Subjects Sample)
The set of data generated by the subset of subjects who complied with the protocol sufficiently to ensure that these data would be likely to exhibit the effects of treatment, according to the underlying scientific model. Compliance covers such considerations as exposure to treatment, availability of measurements and absence of major protocol violations.

Safety & Tolerability
The safety of a medical product concerns the medical risk to the subject, usually assessed in a clinical trial by laboratory tests (including clinical chemistry and haematology), vital signs, clinical adverse events (diseases, signs and symptoms), and other special safety tests (e.g. ECGs, ophthalmology). The tolerability of the medical product represents the degree to which overt adverse effects can be tolerated by the subject.

Statistical Analysis Plan
A statistical analysis plan is a document that contains a more technical and detailed elaboration of the principal features of the analysis described in the protocol, and

includes detailed procedures for executing the statistical analysis of the primary and secondary variables and other data.

Superiority Trial
A trial with the primary objective of showing that the response to the investigational product is superior to a comparative agent (active or placebo control).

Surrogate Variable
A variable that provides an indirect measurement of effect in situations where direct measurement of clinical effect is not feasible or practical.

Treatment Effect
An effect attributed to a treatment in a clinical trial. In most clinical trials the treatment effect of interest is a comparison (or contrast) of two or more treatments.

Treatment Emergent
An event that emerges during treatment having been absent pre-treatment, or worsens relative to the pre-treatment state.

Trial Statistician
A statistician who has a combination of education/training and experience sufficient to implement the principles in this guidance and who is responsible for the statistical aspects of the trial.

Declaration of Helsinki

Recommendations guiding physicians in biomedical research involving human subjects

Adopted by the 18th World Medical Assembly, Helsinki, Finland, June 1964 and amended in Tokyo 1975, in Venice 1983, in Hong Kong 1989 and in South Africa, October 1996.

Introduction

It is the mission of the physician to safeguard the health of the people. His or her knowledge and conscience are dedicated to the fulfilment of this mission.

The Declaration of Geneva of the World Medical Association binds the physician with the words, "The health of my patient will be my first consideration", and the International Code of Medical Ethics declares that "A physician shall act only in the patient's interest when providing medical care which might have the effect of weakening the physical and mental condition of the patient".

The purpose of biomedical research involving human subjects must be to improve diagnostic, therapeutic and prophylactic procedures and the understanding of aetiology and pathogenesis of disease.

In current medical practice most diagnostic, therapeutic or prophylactic procedures involve hazards. This applies especially to biomedical research.

Medical progress is based on research in which ultimately must rest in part on experimentation involving human subjects.

In the field of biomedical research a fundamental distinction must be recognized between medical research in which the aim is essentially diagnostic or therapeutic for a patient, and medical research, the essential object of which is purely scientific and without implying direct diagnostic or therapeutic value to the person subjected to the research.

Special caution must be exercized in the conduct of research, which may affect the environment, and the welfare of animals used for research must be respected.

Because it is essential that the results of laboratory experiments be applied to human beings to further scientific knowledge and to help suffering humanity, the World Medical Association has prepared the following recommendations as a guide to every physician in biomedical research involving human subjects. They should be kept under review in the future. It must be stressed that the standards as drafted are only a guide to physicians all over the world. Physicians are not relieved from criminal, civil and ethical responsibilities under the laws of their own countries.

I. Basic principles

1. Biomedical research involving human subjects must conform to generally accepted scientific principles and should be based on adequately performed labora-

tory and animal experimentation and on a thorough knowledge of the scientific literature.

2. The design and performance of each experimental procedure involving human subjects should be clearly formulated in an experimental protocol which should be transmitted for consideration, comment and guidance to a especially appointed committee independent of the investigator and the sponsor provided that this independent committee is in conformity which the laws and the regulation of the country in which the research is performed.

3. Biomedical research involving human subjects should be conducted only by scientifically qualified persons and under the supervision of a clinically competent medical person. The responsibility for the human subject must always rest with a medically qualified person and never rest on the subject of the research, even though the subject has given his or her consent.

4. Biomedical research involving human subjects cannot legitimately be carried out unless the importance of the objective is in proportion to the inherent risk to the subject.

5. Every biomedical research project involving human subjects should be preceded by careful assessment of predictable risks in comparison with foreseeable benefits to the subject or to others. Concern for the interests of the subject must always prevail over other interests of science and society.

6. The right of the research subject to safeguard his or her integrity must always be respected. Every precaution should be taken to respect the privacy of the subject and to minimize the impact of the study on the subject's physical and mental integrity and on the personality of the subject.

7. Physicians should abstain from engaging in research projects involving human subjects unless they are satisfied that the hazards involved are believed to be predictable. Physicians should cease any investigation if the hazards are found to outweigh the potential benefits.

8. In publication of the results of his or her research, the physician is obliged to preserve the accuracy of the results. Reports of experimentation not in accordance with the principles laid down in this Declaration should not be accepted for publication.

9. In any research on human beings, each potential subject must be adequately informed of the aims, methods, anticipated benefits and potential hazards of the study and the discomfort it may entail. He or she should be informed that he or she is at liberty to abstain from participation in the study and that he or she is free to withdraw his or her consent to participation at any time. The physician should then obtain the subject's freely-given informed consent, preferably in writing.

10. When obtaining informed consent for the research project the physician should be particularly cautious if the subject is in a dependent relationship to him or her or may consent under duress. In that case the informed consent should be obtained by a physician who is not engaged in the investigation and who is completely independent of this official relationship.

11. In the case of legal incompetence, informed consent should be obtained from the legal guardian in accordance with national legislation. Where physical or mental incapacity makes it impossible to obtain informed consent, or when the subject is a minor, permission from the responsible relative replaces that of the subject in accordance with national legislation.

Whenever the minor child is in fact able to give a consent, the minor's consent must be obtained in addition to the consent of the minor's legal guardian.

12. The research protocol should always contain a statement of the ethical considerations involved and should indicate that the principles enunciated in the present Declaration are complied with.

II. Medical research combined with professional care (clinical research)

1. In the treatment of the sick person, the physician must be free to use a new diagnostic and therapeutic measure, if in his or her judgement it offers hope of saving life, re-establishing health or alleviating suffering.

2. The potential benefits, hazards or discomfort of a new method should be weighed against the advantages of the best current diagnostic and therapeutic methods.

3. In any medical study, every patient – including those of a control group, if any – should be assured of the best proven diagnostic and therapeutic method. This does not exclude the use of inert placebo in studies where no proven diagnostic or therapeutic method exists.

4. The refusal of the patient to participate in a study must never interfere with the physician-patient relationship.

5. If the physician considers it essential not to obtain informed consent, the specific reasons for this proposal should be stated in the experimental protocol for transmission to the independent committee.

6. The physician can combine medical research with professional care, the objective being the acquisition of new medical knowledge, only to the extent that medical research is justified by its potential diagnostic or therapeutic value for the patient.

III. Non therapeutic biomedical research involving human subjects (non-clinical biomedical research)

1. In the purely scientific application of medical research carried out on a human being, it is the duty of the physician to remain the protector of the life and health of that person on whom biomedical research is being carried out.

2. The subjects should be volunteers – either healthy persons or patients for whom the experimental design is not related to the patient's illness.

3. The investigator or the investigating team should discontinue the research if in his/her or their judgement it may, if continued, be harmful to the individual.

4. In research on man, the interests of science and society should never take precedence over considerations related to the well-being of the subject.

Initiated: 1964

17.C
Original: English

WORLD MEDICAL ASSOCIATION DECLARATION OF HELSINKI

Ethical Principles
for
Medical Research Involving Human Subjects

Adopted by the 18th WMA General Assembly
Helsinki, Finland, June 1964
and amended by the
29th WMA General Assembly, Tokyo, Japan, October 1975
35th WMA General Assembly, Venice, Italy, October 1983
41st WMA General Assembly, Hong Kong, September 1989
48th WMA General Assembly, Somerset West, Republic of South Africa, October 1996
and the
52nd WMA General Assembly, Edinburgh, Scotland, October 2000

A. INTRODUCTION

1. The World Medical Association has developed the Declaration of Helsinki as a statement of ethical principles to provide guidance to physicians and other participants in medical research involving human subjects. Medical research involving human subjects includes research on identifiable human material or identifiable data.

2. It is the duty of the physician to promote and safeguard the health of the people. The physician's knowledge and conscience are dedicated to the fulfilment of this duty.

3. The Declaration of Geneva of the World Medical Association binds the physician with the words, "The health of my patient will be my first consideration", and the International Code of Medical Ethics declares that, "A physician shall act only in the patient's interest when providing medical care which might have the effect of weakening the physical and mental condition of the patient".

4. Medical progress is based on research which ultimately must rest in part on experimentation involving human subjects.

5. In medical research on human subjects, considerations related to the well-being of the human subject should take precedence over the interests of science and society.

6. The primary purpose of medical research involving human subjects is to improve prophylactic, diagnostic and therapeutic procedures and the understanding of the aetiology and pathogenesis of disease. Even the best proven prophylactic, diagnostic, and therapeutic methods must continuously be challenged through research for their effectiveness, efficiency, accessibility and quality.

7. In current medical practice and in medical research, most prophylactic, diagnostic and therapeutic procedures involve risks and burdens.

8. Medical research is subject to ethical standards that promote respect for all human beings and protect their health and rights. Some research populations are vulnerable and need special protection. The particular needs of the economically and medically disadvantaged must be recognized. Special attention is also required for those who cannot give or refuse consent for themselves, for those who may be subject to giving consent under duress, for those who will not benefit personally from the research and for those for whom the research is combined with care.

9. Research Investigators should be aware of the ethical, legal and regulatory requirements for research on human subjects in their own countries as well as applicable international requirements. No national ethical, legal or regulatory requirement should be allowed to reduce or eliminate any of the protections for human subjects set forth in this Declaration.

B. BASIC PRINCIPLES FOR ALL MEDICAL RESEARCH

10. It is the duty of the physician in medical research to protect the life, health, privacy, and dignity of the human subject.

11. Medical research involving human subjects must conform to generally accepted scientific principles, be based on a thorough knowledge of the scientific literature, other relevant sources of information, and on adequate laboratory and, where appropriate, animal experimentation.

12. Appropriate caution must be exercised in the conduct of research which may affect the environment, and the welfare of animals used for research must be respected.

13. The design and performance of each experimental procedure involving human subjects should be clearly formulated in an experimental protocol. This protocol should be submitted for consideration, comment, guidance, and where appropriate, approval to a specially appointed ethical review committee, which must be independent of the investigator, the sponsor or any other kind of undue influence. This independent committee should be in conformity with

the laws and regulations of the country in which the research experiment is performed. The committee has the right to monitor ongoing trials. The researcher has the obligation to provide monitoring information to the committee, especially any serious adverse events. The researcher should also submit to the committee, for review, information regarding funding, sponsors, institutional affiliations, other potential conflicts of interest and incentives for subjects.

14. The research protocol should always contain a statement of the ethical considerations involved and should indicate that there is compliance with the principles enunciated in this Declaration.

15. Medical research involving human subjects should be conducted only by scientifically qualified persons and under the supervision of a clinically competent medical person. The responsibility for the human subject must always rest with a medically qualified person and never rest on the subject of the research, even though the subject has given consent.

16. Every medical research project involving human subjects should be preceded by careful assessment of predictable risks and burdens in comparison with foreseeable benefits to the subject or to others. This does not preclude the participation of healthy volunteers in medical research. The design of all studies should be publicly available.

17. Physicians should abstain from engaging in research projects involving human subjects unless they are confident that the risks involved have been adequately assessed and can be satisfactorily managed. Physicians should cease any investigation if the risks are found to outweigh the potential benefits or if there is conclusive proof of positive and beneficial results.

18. Medical research involving human subjects should only be conducted if the importance of the objective outweighs the inherent risks and burdens to the subject. This is especially important when the human subjects are healthy volunteers.

19. Medical research is only justified if there is a reasonable likelihood that the populations in which the research is carried out stand to benefit from the results of the research.

20. The subjects must be volunteers and informed participants in the research project.

21. The right of research subjects to safeguard their integrity must always be respected. Every precaution should be taken to respect the privacy of the subject, the confidentiality of the patient's information and to minimize the impact of the study on the subject's physical and mental integrity and on the personality of the subject.

22. In any research on human beings, each potential subject must be adequately informed of the aims, methods, sources of funding, any possible conflicts of interest, institutional affiliations of the researcher, the anticipated benefits and potential risks of the study and the discomfort it may entail. The subject should be informed of the right to abstain from participation in the study or to withdraw consent to participate at any time without reprisal. After ensuring that the subject has understood the information, the physician should then obtain the subject's freely-given informed consent, preferably in writing. If the consent cannot be obtained in writing, the non-written consent must be formally documented and witnessed.

23. When obtaining informed consent for the research project the physician should be particularly cautious if the subject is in a dependent relationship with the physician or may consent under duress. In that case the informed consent should be obtained by a well-informed physician who is not engaged in the investigation and who is completely independent of this relationship.

24. For a research subject who is legally incompetent, physically or mentally incapable of giving consent or is a legally incompetent minor, the investigator must obtain informed consent from the legally authorized representative in accordance with applicable law. These groups should not be included in research unless the research is necessary to promote the health of the population represented and this research cannot instead be performed on legally competent persons.

25. When a subject deemed legally incompetent, such as a minor child, is able to give assent to decisions about participation in research, the investigator must obtain that assent in addition to the consent of the legally authorized representative.

26. Research on individuals from whom it is not possible to obtain consent, including proxy or advance consent, should be done only if the physical/mental condition that prevents obtaining informed consent is a necessary characteristic of the research population. The specific reasons for involving research subjects with a condition that renders them unable to give informed consent should be stated in the experimental protocol for consideration and approval of the review committee. The protocol should state that consent to remain in the research should be obtained as soon as possible from the individual or a legally authorized surrogate.

27. Both authors and publishers have ethical obligations. In publication of the results of research, the investigators are obliged to preserve the accuracy of the results. Negative as well as positive results should be published or otherwise publicly available. Sources of funding, institutional affiliations and any possible conflicts of interest should be declared in the publication. Reports of experimentation not in accordance with the principles laid down in this Declaration should not be accepted for publication.

C. ADDITIONAL PRINCIPLES FOR MEDICAL RESEARCH COMBINED WITH MEDICAL CARE

28. The physician may combine medical research with medical care, only to the extent that the research is justified by its potential prophylactic, diagnostic or therapeutic value. When medical research is combined with medical care, additional standards apply to protect the patients who are research subjects.

29. The benefits, risks, burdens and effectiveness of a new method should be tested against those of the best current prophylactic, diagnostic, and therapeutic methods. This does not exclude the use of placebo, or no treatment, in studies where no proven prophylactic, diagnostic or therapeutic method exists.

30. At the conclusion of the study, every patient entered into the study should be assured of access to the best proven prophylactic, diagnostic and therapeutic methods identified by the study.

31. The physician should fully inform the patient which aspects of the care are related to the research. The refusal of a patient to participate in a study must never interfere with the patient-physician relationship.

32. In the treatment of a patient, where proven prophylactic, diagnostic and therapeutic methods do not exist or have been ineffective, the physician, with informed consent from the patient, must be free to use unproven or new prophylactic, diagnostic and therapeutic measures, if in the physician's judgement it offers hope of saving life, re-establishing health or alleviating suffering. Where possible, these measures should be made the object of research, designed to evaluate their safety and efficacy. In all cases, new information should be recorded and, where appropriate, published. The other relevant guidelines of this Declaration should be followed.

7.10.2000 09h14

TDR/PRD/ETHICS/2000.1

Operational Guidelines for Ethics Committees that Review Biomedical Research

World Health Organization
Geneva
2000

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PREFACE

The ethical and scientific standards for carrying out biomedical research on human subjects have been developed and established in international guidelines, including the Declaration of Helsinki, the CIOMS International Ethical Guidelines for Biomedical Research Involving Human Subjects, and the WHO and ICH Guidelines for Good Clinical Practice. Compliance with these guidelines helps to ensure that the dignity, rights, safety, and well-being of research participants are promoted and that the results of the investigations are credible.

All international guidelines require the ethical and scientific review of biomedical research alongside informed consent and the appropriate protection of those unable to consent as essential measures to protect the individual person and the communities who participate in research. For the purposes of these Guidelines, biomedical research includes research on pharmaceuticals, medical devices, medical radiation and imaging, surgical procedures, medical records, and biological samples, as well as epidemiological, social, and psychological investigations.

These Guidelines are intended to facilitate and support ethical review in all countries around the world. They are based on a close examination of the requirements for ethical review as established in international guidelines, as well as on an evaluation of existing practices of ethical review in countries around the world. They do not, however, purport to replace the need for national and local guidelines for the ethical review of biomedical research, nor do they intend to supersede national laws and regulations.

The majority of biomedical research has been predominantly motivated by concern for the benefit of already privileged communities. This is reflected by the fact that the WHO estimates that 90% of the resources devoted to research and development on medical problems are applied to diseases causing less than 10% of the present global suffering. The establishment of international guidelines that assist in strengthening the capacity for the ethical review of biomedical research in all countries contributes to redressing this imbalance.

1. OBJECTIVE

The objective of these Guidelines is to contribute to the development of quality and consistency in the ethical review of biomedical research. The Guidelines are intended to complement existing laws, regulations, and practices, and to serve as a basis upon which ethics committees (ECs) can develop their own specific written procedures for their functions in biomedical research. In this regard, the Guidelines establish an international standard for ensuring quality in ethical review. The Guidelines should be used by national and local bodies in developing, evaluating, and progressively refining standard operating procedures for the ethical review of biomedical research.

2. THE ROLE OF AN EC

The purpose of an EC in reviewing biomedical research is to contribute to safeguarding the dignity, rights, safety, and well-being of all actual or potential research participants. A cardinal principle of research involving human participants is 'respect for the dignity of persons'. The goals of research, while important, should never be permitted to override the health, well-being, and care of research participants. ECs should also take into consideration the principle of justice. Justice requires that the benefits and burdens of research be distributed fairly among all groups and classes in society, taking into account age, gender, economic status, culture, and ethnic considerations.

ECs should provide independent, competent, and timely review of the ethics of proposed studies. In their composition, procedures, and decision-making, ECs need to have independence from political, institutional, professional, and market influences. They need similarly to demonstrate competence and efficiency in their work.

ECs are responsible for carrying out the review of proposed research before the commencement of the research. They also need to ensure that there is regular evaluation of the ethics of ongoing studies that received a positive decision.

ECs are responsible for acting in the full interest of potential research participants and concerned communities, taking into account the interests and needs of the researchers, and having due regard for the requirements of relevant regulatory agencies and applicable laws.

3. ESTABLISHING A SYSTEM OF ETHICAL REVIEW

Countries, institutions, and communities should strive to develop ECs and ethical review systems that ensure the broadest possible coverage of protection for potential research participants and contribute to the highest attainable quality in the science and ethics of biomedical research. States should promote, as appropriate, the establishment of ECs at the national, institutional, and local levels that are independent, multi-disciplinary, multi-sectorial, and pluralistic in nature. ECs require administrative and financial support.

Procedures need to be established for relating various levels of review in order to ensure consistency and facilitate cooperation. Mechanism for cooperation and communication need to be developed between national committees and institutional

and local committees. These mechanisms should ensure clear and efficient communication. They should also promote the development of ethical review within a country as well as the ongoing education of members of ethics committees. In addition, procedures need to be established for the review of biomedical research protocols carried out at more than one site in a country or in more than one country. A network of ethical review should be established at the regional, national, and local levels that ensures the highest competence in biomedical review while also guaranteeing input from all levels of the community.

4. CONSTITUTING AN EC

ECs should be constituted to ensure the competent review and evaluation of all ethical aspects of the research projects they receive and to ensure that their tasks can be executed free from bias and influence that could affect their independence.

ECs should be multidisciplinary and multi-sectorial in composition, including relevant scientific expertise, balanced age and gender distribution, and laypersons representing the interests and the concerns of the community.

ECs should be established in accordance with the applicable laws and regulations of the country and in accordance with the values and principles of the communities they serve.

ECs should establish publicly available standard operating procedures that state the authority under which the committee is established, the functions and duties of the EC, membership requirements, the terms of appointment, the conditions of appointment, the offices, the structure of the secretariat, internal procedures, and the quorum requirements. ECs should act in accordance with their written operating procedures.

It may be helpful to summarize the activities of the EC in a regular (annual) report.

4.1 Membership Requirements

Clear procedures for identifying or recruiting potential EC members should be established. A statement should be drawn up of the requirements for candidacy that includes an outline of the duties and responsibilities of EC members.

Membership requirements should be established that include the following:

4.1.1 the name or description of the party responsible for making appointments;

4.1.2 the procedure for selecting members, including the method for appointing a member (e.g. by consensus, by majority vote, by direct appointment);

4.1.3 conflicts of interest should be avoided when making appointments, but where unavoidable there should be transparency with regard to such interests.

A rotation system for membership should be considered that allows for continuity, the development and maintenance of expertise within the EC, and the regular input of fresh ideas and approaches.

4.2 Terms of Appointment

Terms of appointment should be established that include the following:

4.2.1 the duration of an appointment,

4.2.2 the policy for the renewal of an appointment,

4.2.3 the disqualification procedure,

4.2.4 the resignation procedure,

4.2.5 the replacement procedure.

4.3 Conditions of Appointment

A statement of the conditions of appointment should be drawn up that includes the following:

4.3.1 a member should be willing to publicize his/her full name, profession, and affiliation;

4.3.2 all reimbursement for work and expenses, if any, within or related to an EC should be recorded and made available to the public upon request;

4.3.3 a member should sign a confidentiality agreement regarding meeting deliberations, applications, information on research participants, and related matters; in addition, all EC administrative staff should sign a similar confidentiality agreement.

4.4 Offices

ECs should establish clearly defined offices for the good functioning of ethical review. A statement is required of the officers within the EC (e.g. chairperson, secretary), the requirements for holding each office, the terms and conditions of each office, and the duties and responsibilities of each office (e.g. agenda, minutes, notification of decisions). Clear procedures for selecting or appointing officers should be established.

In addition to the EC officers, an EC should have adequate support staff for carrying out its responsibilities.

4.5 Quorum Requirements

ECs should establish specific quorum requirements for reviewing and deciding on an application. These requirements should include:

4.5.1 the minimum number of members required to compose a quorum (e.g. more than half the members);

4.5.2 the professional qualifications requirements (e.g. physician, lawyer, statistician, paramedical, layperson) and the distribution of those requirements over the quorum; no quorum should consist entirely of members of one profession or one gender; a quorum should include at least one member whose primary area of expertise is in a non-scientific area, and at least one member who is independent of the institution/research site.

4.6 Independent Consultants

ECs may call upon, or establish a standing list of, independent consultants who may provide special expertise to the EC on proposed research protocols. These consultants may be specialists in ethical or legal aspects, specific diseases or methodologies, or they may be representatives of communities, patients, or special interest groups. Terms of reference for independent consultants should be established.

4.7 Education for EC Members

EC members have a need for initial and continued education regarding the ethics and science of biomedical research. The conditions of appointment should state the provisions available for EC members to receive introductory training in the work of an EC as well as ongoing opportunities for enhancing their capacity for ethical review. These conditions should also include the requirements or expectations regarding the initial and continuing education of EC members. This education may be linked to co-operative arrangements with other ECs in the area, the country, and the region, as well as other opportunities for the initial and continued training of EC members.

5. SUBMITTING AN APPLICATION

ECs are responsible for establishing well-defined requirements for submitting an application for review of a biomedical research project. These requirements should be readily available to prospective applicants.

5.1 Application

An application for review of the ethics of proposed biomedical research should be submitted by a qualified researcher responsible for the ethical and scientific conduct of the research.

5.2 Application Requirements

The requirements for the submission of a research project for ethical review should be clearly described in an application procedure. These requirements should include the following:

5.2.1 the name(s) and address(es) of the EC secretariat or member(s) to whom the application material is to be submitted;

5.2.2 the application form(s);

5.2.3 the format for submission;

5.2.4 the documentation (see 5.3);

5.2.5 the language(s) in which (core) documents are to be submitted;

5.2.6 the number of copies to be submitted;

5.2.7 the deadlines for submission of the application in relation to review dates;

5.2.8 the means by which applications will be acknowledged, including the communication of the incompleteness of an application;

5.2.9 the expected time for notification of the decision following review;

5.2.10 the time frame to be followed in cases where the EC requests supplementary information or changes to documents from the applicant;

5.2.11 the fee structure, if any, for reviewing an application;

5.2.12 the application procedure for amendments to the protocol, the recruitment material, the potential research participant information, or the informed consent form.

5.3 Documentation

All documentation required for a thorough and complete review of the ethics of proposed research should be submitted by the applicant. This may include, but is not limited to,

5.3.1 signed and dated application form;

5.3.2 the protocol of the proposed research (clearly identified and dated), together with supporting documents and annexes;

5.3.3 a summary (as far as possible in non-technical language), synopsis, or diagrammatic representation ('flowchart') of the protocol;

5.3.4 a description (usually included in the protocol) of the ethical considerations involved in the research;

5.3.5 case report forms, diary cards, and other questionnaires intended for research participants;

5.3.6 when the research involves a study product (such as a pharmaceutical or device under investigation), an adequate summary of all safety, pharmacological, pharmaceutical, and toxicological data available on the study product, together with a summary of clinical experience with the study product to date (e.g. recent investigator's brochure, published data, a summary of the product's characteristics);

5.3.7 investigator's(s') curriculum vitae (updated, signed, and dated);

5.3.8 material to be used (including advertisements) for the recruitment of potential research participants;

5.3.9 a description of the process used to obtain and document consent;

5.3.10 written and other forms of information for potential research participants (clearly identified and dated) in the language(s) understood by the potential research participants and, when required, in other languages;

5.3.11 informed consent form (clearly identified and dated) in the language(s) understood by the potential research participants and, when required, in other languages;

5.3.12 a statement describing any compensation for study participation (including expenses and access to medical care) to be given to research participants;

5.3.13 a description of the arrangements for indemnity, if applicable;

5.3.14 a description of the arrangements for insurance coverage for research participants, if applicable;

5.3.15 a statement of agreement to comply with ethical principles set out in relevant guidelines;

5.3.16 all significant previous decisions (e.g. those leading to a negative decision or modified protocol) by other ECs or regulatory authorities for the proposed study (whether in the same location or elsewhere) and an indication of modification(s) to the protocol made on that account. The reasons for previous negative decisions should be provided.

6. REVIEW

All properly submitted applications should be reviewed in a timely fashion and according to an established review procedure.

6.1 Meeting Requirements

ECs should meet regularly on scheduled dates that are announced in advance. The meeting requirements should include the following:

6.1.1 meetings should be planned in accordance with the needs of the workload;

6.1.2 EC members should be given enough time in advance of the meeting to review the relevant documents;

6.1.3 meetings should be minuted; there should be an approval procedure for the minutes;

6.1.4 the applicant, sponsor, and/or investigator may be invited to present the proposal or elaborate on specific issues;

6.1.5 independent consultants may be invited to the meeting or to provide written comments, subject to applicable confidentiality agreements.

6.2 Elements of the Review

The primary task of an EC lies in the review of research proposals and their supporting documents, with special attention given to the informed consent process, documentation, and the suitability and feasibility of the protocol. ECs need to take into account prior scientific reviews, if any, and the requirements of applicable laws and regulations. The following should be considered, as applicable:

6.2.1 *Scientific Design and Conduct of the Study*

6.2.1.1 the appropriateness of the study design in relation to the objectives of the study, the statistical methodology (including sample size calculation), and the potential for reaching sound conclusions with the smallest number of research participants;

6.2.1.2 the justification of predictable risks and inconveniences weighed against the anticipated benefits for the research participants and the concerned communities;

6.2.1.3 the justification for the use of control arms;

6.2.1.4 criteria for prematurely withdrawing research participants;

6.2.1.5 criteria for suspending or terminating the research as a whole;

6.2.1.6 the adequacy of provisions made for monitoring and auditing the conduct of the research, including the constitution of a data safety monitoring board (DSMB);

6.2.1.7 the adequacy of the site, including the supporting staff, available facilities, and emergency procedures;

6.2.1.8 the manner in which the results of the research will be reported and published;

6.2.2 *Recruitment of Research Participants*

6.2.2.1 the characteristics of the population from which the research participants will be drawn (including gender, age, literacy, culture, economic status, and ethnicity);

6.2.2.2 the means by which initial contact and recruitment is to be conducted;

6.2.2.3 the means by which full information is to be conveyed to potential research participants or their representatives;

6.2.2.4 inclusion criteria for research participants;

6.2.2.5 exclusion criteria for research participants;

6.2.3 *Care and Protection of Research Participants*

6.2.3.1 the suitability of the investigator(s)'s qualifications and experience for the proposed study;

6.2.3.2 any plans to withdraw or withhold standard therapies for the purpose of the research, and the justification for such action;

6.2.3.3 the medical care to be provided to research participants during and after the course of the research;

6.2.3.4 the adequacy of medical supervision and psycho-social support for the research participants;

6.2.3.5 steps to be taken if research participants voluntarily withdraw during the course of the research;

6.2.3.6 the criteria for extended access to, the emergency use of, and/or the compassionate use of study products;

6.2.3.7 the arrangements, if appropriate, for informing the research participant's general practitioner (family doctor), including procedures for seeking the participant's consent to do so;

6.2.3.8 a description of any plans to make the study product available to the research participants following the research;

6.2.3.9 a description of any financial costs to research participants;

6.2.3.10 the rewards and compensations for research participants (including money, services, and/or gifts);

6.2.3.11 the provisions for compensation/treatment in the case of the injury/disability/death of a research participant attributable to participation in the research;

6.2.3.12 the insurance and indemnity arrangements;

6.2.4 *Protection of Research Participant Confidentiality*

6.2.4.1 a description of the persons who will have access to personal data of the research participants, including medical records and biological samples;

6.2.4.2 the measures taken to ensure the confidentiality and security of personal information concerning research participants;

6.2.5 *Informed Consent Process*

6.2.5.1 a full description of the process for obtaining informed consent, including the identification of those responsible for obtaining consent;

6.2.5.2 the adequacy, completeness, and understandability of written and oral information to be given to the research participants, and, when appropriate, their legally acceptable representative(s);

6.2.5.3 clear justification for the intention to include in the research individuals who cannot consent, and a full account of the arrangements for obtaining consent or authorization for the participation of such individuals;

6.2.5.4 assurances that research participants will receive information that becomes available during the course of the research relevant to their participation (including their rights, safety, and well-being);

6.2.5.5 the provisions made for receiving and responding to queries and complaints from research participants or their representatives during the course of a research project;

6.2.6 *Community Considerations*

6.2.6.1 the impact and relevance of the research on the local community and on the concerned communities from which the research participants are drawn;

6.2.6.2 the steps taken to consult with the concerned communities during the course of designing the research;

6.2.6.3 the influence of the community on the consent of individuals;

6.2.6.4 proposed community consultation during the course of the research;

6.2.6.5 the extent to which the research contributes to capacity building, such as the enhancement of local healthcare, research, and the ability to respond to public health needs;

6.2.6.6 a description of the availability and affordability of any successful study product to the concerned communities following the research;

6.2.6.7 the manner in which the results of the research will be made available to the research participants and the concerned communities.

6.3 Expedited Review

ECs should establish procedures for the expedited review of research proposals. These procedures should specify the following:

6.3.1 the nature of the applications, amendments, and other considerations that will be eligible for expedited review;

6.3.2 the quorum requirement(s) for expedited review;

6.3.3 the status of decisions (e.g. subject to confirmation by full EC or not).

7. DECISION-MAKING

In making decisions on applications for the ethical review of biomedical research, an EC should take the following into consideration:

7.1 a member should withdraw from the meeting for the decision procedure concerning an application where there arises a conflict of interest; the conflict of interest should be indicated to the chairperson prior to the review of the application and recorded in the minutes;

7.2 a decision may only be taken when sufficient time has been allowed for review and discussion of an application in the absence of non-members (e.g. the investigator, representatives of the sponsor, independent consultants) from the meeting, with the exception of EC staff;

7.3 decisions should only be made at meetings where a quorum (as stipulated in the EC's written operating procedures) is present;

7.4 the documents required for a full review of the application should be complete and the relevant elements mentioned above (see 6.2) should be considered before a decision is made;

7.5 only members who participate in the review should participate in the decision;

7.6 there should be a predefined method for arriving at a decision (e.g. by consensus, by vote); it is recommended that decisions be arrived at through consensus, where possible; when a consensus appears unlikely, it is recommended that the EC vote;

7.7 advice that is non-binding may be appended to the decision;

7.8 in cases of conditional decisions, clear suggestions for revision and the procedure for having the application re-reviewed should be specified;

7.9 a negative decision on an application should be supported by clearly stated reasons.

8. COMMUNICATING A DECISION

A decision should be communicated in writing to the applicant according to EC procedures, preferably within two weeks' time of the meeting at which the decision was made. The communication of the decision should include, but is not limited to, the following:

8.1 the exact title of the research proposal reviewed;

8.2 the clear identification of the protocol of the proposed research or amendment, date and version number (if applicable), on which the decision is based;

8.3 the names and (where possible) specific identification numbers (version numbers/dates) of the documents reviewed, including the potential research participant information sheet/material and informed consent form;

8.4 the name and title of the applicant;

8.5 the name of the site(s);

8.6 the date and place of the decision;

8.7 the name of the EC taking the decision;

8.8 a clear statement of the decision reached;

8.9 any advice by the EC;

8.10 in the case of a conditional decision, any requirements by the EC, including suggestions for revision and the procedure for having the application re-reviewed;

8.11 in the case of a positive decision, a statement of the responsibilities of the applicant; for example, confirmation of the acceptance of any requirements imposed by the EC; submission of progress report(s); the need to notify the EC in cases of protocol amendments (other than amendments involving only logistical or administrative aspects of the study); the need to notify the EC in the case of amendments to the recruitment material, the potential research participant information, or the informed consent form; the need to report serious and unexpected adverse events related to the conduct of the study; the need to report unforeseen circumstances, the termination of the study, or significant decisions by other ECs; the information the EC expects to receive in order to perform ongoing review; the final summary or final report;

8.12 the schedule/plan of ongoing review by the EC;

8.13 in the case of a negative decision, clearly stated reason(s) for the negative decision;

8.14 signature (dated) of the chairperson (or other authorized person) of the EC.

9. FOLLOW-UP

ECs should establish a follow-up procedure for following the progress of all studies for which a positive decision has been reached, from the time the decision was taken until the termination of the research. The ongoing lines of communication

between the EC and the applicant should be clearly specified. The follow-up procedure should take the following into consideration:

9.1 the quorum requirements, the review procedure, and the communication procedure for follow-up reviews, which may vary from the requirements and procedures for the initial decision on an application;

9.2 the follow-up review intervals should be determined by the nature and the events of research projects, though each protocol should undergo a follow-up review at least once a year;

9.3 the following instances or events require the follow-up review of a study:

a. any protocol amendment likely to affect the rights, safety, and/or well-being of the research participants or the conduct of the study;

b. serious and unexpected adverse events related to the conduct of the study or study product, and the response taken by investigators, sponsors, and regulatory agencies;

c. any event or new information that may affect the benefit/risk ratio of the study;

9.4 a decision of a follow-up review should be issued and communicated to the applicant, indicating a modification, suspension, or termination of the EC's original decision or confirmation that the decision is still valid;

9.5 in the case of the premature suspension/termination of a study, the applicant should notify the EC of the reasons for suspension/termination; a summary of results obtained in a study prematurely suspended/terminated should be communicated to the EC;

9.6 ECs should receive notification from the applicant at the time of the completion of a study;

9.7 ECs should receive a copy of the final summary or final report of a study.

10. DOCUMENTATION AND ARCHIVING

All documentation and communication of an EC should be dated, filed, and archived according to written procedures. A statement is required defining the access and retrieval procedure (including authorized persons) for the various documents, files, and archives.

It is recommended that documents be archived for a minimum period of 3 years following the completion of a study.

Documents that should be filed and archived include, but are not limited to,

10.1 the constitution, written standard operating procedures of the EC, and regular (annual) reports;

10.2 the curriculum vitae of all EC members;

10.3 a record of all income and expenses of the EC, including allowances and reimbursements made to the secretariat and EC members;

10.4 the published guidelines for submission established by the EC;

10.5 the agenda of the EC meetings;

10.6 the minutes of the EC meetings;

10.7 one copy of all materials submitted by an applicant;

10.8 the correspondence by EC members with applicants or concerned parties regarding application, decision, and follow-up;

10.9 a copy of the decision and any advice or requirements sent to an applicant;

10.10 all written documentation received during the follow-up;

10.11 the notification of the completion, premature suspension, or premature termination of a study;

10.12 the final summary or final report of the study.

GLOSSARY

The definitions provided within this glossary apply to terms as they are used in these Guidelines. The terms may have different meanings in other contexts.

Advice
Non-binding considerations adjoined to a decision intended to provide ethical assistance to those involved in the research.

Applicant
A qualified researcher undertaking the scientific and ethical responsibility for a research project, either on his/her own behalf or on behalf of an organization/firm, seeking a decision from an ethics committee through formal application.

Community
A community is a group of people understood as having a certain identity due to the sharing of common interests or to a shared proximity. A community may be identified as a group of people living in the same village, town, or country and, thus, sharing geographical proximity. A community may be otherwise identified as a group of people sharing a common set of values, a common set of interests, or a common disease.

Conflict of interest
A conflict of interest arises when a member (or members) of the EC holds interests with respect to specific applications for review that may jeopardize his/her (their) ability to provide a free and independent evaluation of the research focused on the protection of the research participants. Conflicts of interests may arise when an EC member has financial, material, institutional, or social ties to the research.

Decision
The response (either positive, conditional or negative), by an EC to an application following the review in which the position of the EC on the ethical validity of the proposed study is stated.

Investigator
A qualified scientist who undertakes scientific and ethical responsibility, either on his/her own behalf or on behalf of an organization/firm, for the ethical and scientific integrity of a research project at a specific site or group of sites. In some instances a coordinating or principal investigator may be appointed as the responsible leader of a team of subinvestigators.

Protocol
A document that provides the background, rationale, and objective(s) of a biomedical research project and describes its design, methodology, and organization, including ethical and statistical considerations. Some of these considerations may be provided in other documents referred to in the protocol.

Protocol amendment
A written description of a change to, or formal clarification of, a protocol.

Requirements
In the context of decisions, requirements are binding elements that express ethical considerations whose implementation the ethics committee requires or views as obligatory in pursuing the research.

Research participant
An individual who participates in a biomedical research project, either as the direct recipient of an intervention (e.g. study product or invasive procedure), as a control, or through observation. The individual may be a healthy person who volunteers to participate in the research, or a person with a condition unrelated to the research carried out who volunteers to participate, or a person (usually a patient) whose condition is relevant to the use of the study product or questions being investigated.

Sponsor
An individual, company, institution, or organization that takes responsibility for the initiation, management, and/or financing of a research project.

SUPPORTING DOCUMENTS

Council for International Organizations of Medical Sciences (CIOMS), in collaboration with the World Health Organization (WHO). *International Ethical Guidelines for Biomedical Research Involving Human Subjects*. Geneva 1993.

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World Health Organization (WHO). Guidelines for Good Clinical Practice (GCP) for Trials on Pharmaceutical Products. Annex 3 of *The Use of Essential Drugs*. Sixth Report of the WHO Expert Committee. Geneva: World Health Organization, 1995: 97-137.

World Medical Association, *Declaration of Helsinki: Recommendations Guiding Physicians in Biomedical Research Involving Human Subjects*. Adopted by the 18th World Medical Assembly, Helsinki, Finland, June 1964. Amended by the 29th World Medical Assembly, Tokyo, Japan, October 1975; the 35th World Medical Assembly, Venice, Italy, October 1983; the 41st World Medical Assembly, Hong Kong, September 1989; and the 48th General Assembly, Somerset West, Republic of South Africa, October 1996.

World Medical Association, *Declaration of Lisbon on the Rights of the Patient*. Adopted by the 34th World Medical Assembly, Lisbon, Portugal, September/October 1981 and amended by the 47th General Assembly, Bali, Indonesia, September 1995.

Operational Guidelines for Ethics Committees Reviewing Biomedical Research

UNDP/World Bank/WHO
Special Programme for Research & Training
in Tropical Diseases
(TDR)

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BACKGROUND

The *Operational Guidelines for Ethics Committees that Review Biomedical Research* is the result of a wide international consultation begun in August 1999 at A Seminar on the Ethical Review of Clinical Research in Asian & Western Pacific Countries organized by TDR WHO in Chiang Mai, Thailand. The participants at the seminar expressed a need for international guidance on the constitution and operation of ethics committees.

The first draft of these *Guidelines* was discussed at a workshop for members of African Ethical Review Committees organized by TDR WHO and the African Malaria Vaccine Testing Network in Arusha, Tanzania, on 5 November 1999. The draft was subsequently presented to an Interim Meeting of the Forum for Ethical Review Committees in the Asian & Western Pacific Regions (FERCAP) in Bethesda, MD, USA, on 9 November 1999. It was also distributed for consultation at the Global Forum for Bioethics in Research organized by the NIH and WHO in Bethesda on 7-10 November 1999. Following these initial consultations the *Guidelines* were redrafted and widely distributed for comment.

Further development of these *Guidelines* was carried out under the auspices of a Secretariat composed of representatives from WHO, UNAIDS, CIOMS, UNESCO, and the WMA. Responsibility for drafting these *Guidelines* was given to an International Drafting Committee of 14 experts from various continents representing a wide range of disciplines in biomedical research and bioethics. The consultation process was carried out through representatives from the African Malaria Vaccine Testing Network, Council of Europe, European Commission, European Medicines Evaluation Agency, National Institutes of Health (USA), Food & Drug Administration (USA), Office for Protection from Research Risks (USA), Centers for Disease Control and Prevention (USA), National Council on Ethics in Human Research (Canada), Faculty of Pharmaceutical Medicine (United Kingdom), European Organization for Research & Treatment of Cancer, International Federation of Pharmaceutical Physicians, Foundation Marcel Mérieux, International Federation of Pharmaceutical Manufacturers' Associations, International Conference on Harmonization, and European Forum for Good Clinical Practice. In addition, the draft text was widely distributed to organizations of ethics committees in Europe and the United States as well as to experts in the field of biomedical research ethics. On 2 January 2000 a new draft was prepared and distributed to the members of the Drafting Working Party, the Secretariat, and the Consultation Partners as well as to other parties who had commented or expressed an interest.

Following on the reception of a wide range of detailed comments from around the world, the text was then widely discussed at a Meeting on Guidelines and Standard Operating Procedures for Ethical Review Committees held in Bangkok on 10-12 January 2000. Participants in this meeting were drawn from the regions of Africa, Asia, Latin America, North America, and Europe, from international organizations, (including WHO, UNAIDS, UNESCO, CIOMS, EFGCP, and IFPMA), and from universities and research institutions. A final deliberation took place at a Drafting Meeting held

on 13 January 2000 in Bangkok. Following the Drafting Meeting a final set of comments were solicited and integrated into the final document.

The purpose of this wide consultative process was to ensure extensive input while fostering the sharing of knowledge from developing and developed countries alongside organizations and institutions with varying degrees of experience and expertise. This process also help to prepare for the dissemination of the final text through an international process of capacity building that would strengthen national and local infrastructures for ethical review throughout the world.

The *Operational Guidelines for Ethics Committees That Review Biomedical Research* are proposed by the WHO and CIOMS as a support for improving the organization, quality, and standards of ethical review around the world. These *Guidelines* take into account current practices while suggesting guidance for a harmonized state-of-the-art approach.

Comments and suggestions on all aspects of these guidelines are welcome for consideration in future revisions of this document. Please correspond with:

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