# Clinical Trial Biostatistics and Biopharmaceutical Applications Edited by

Walter R. Young Ding-Geng (Din) Chen



# <u>Clinical Trial Biostatistics And Biopharmaceutical</u> <u>Applications</u>

**Ding-Geng Chen** 

#### **Clinical Trial Biostatistics And Biopharmaceutical Applications:**

Clinical Trial Biostatistics and Biopharmaceutical Applications Walter R. Young, Ding-Geng (Din) Chen, 2014-11-20 Since 1945 The Annual Deming Conference on Applied Statistics has been an important event in the statistics profession In Clinical Trial Biostatistics and Biopharmaceutical Applications prominent speakers from past Deming conferences present novel biostatistical methodologies in clinical trials as well as up to date biostatistical applications from the pharmaceutical industry Divided into five sections the book begins with emerging issues in clinical trial design and analysis including the roles of modeling and simulation the pros and cons of randomization procedures the design of Phase II dose ranging trials thorough QT QTc clinical trials and assay sensitivity and the constancy assumption in noninferiority trials The second section examines adaptive designs in drug development discusses the consequences of group sequential and adaptive designs and illustrates group sequential design in R The third section focuses on oncology clinical trials covering competing risks escalation with overdose control EWOC dose finding and interval censored time to event data In the fourth section the book describes multiple test problems with applications to adaptive designs graphical approaches to multiple testing the estimation of simultaneous confidence intervals for multiple comparisons and weighted parametric multiple testing methods The final section discusses the statistical analysis of biomarkers from omics technologies biomarker strategies applicable to clinical development and the statistical evaluation of surrogate endpoints This book clarifies important issues when designing and analyzing clinical trials including several misunderstood and unresolved challenges It will help readers choose the right method for their biostatistical application Each chapter is self contained with references **Biostatistics in** 

Biopharmaceutical Research and Development Ding-Geng Chen, 2024-12-24 The Deming Conference on Applied Statistics has long been deemed an influential event in the biostatistics and biopharmaceutical profession It provides learning experience on recent developments in statistical methodologies in biopharmaceutical applications and FDA regulations This book honors 80 years of contributions and dedication of the Deming Conference in biostatistics and biopharmaceutical clinical trial methodology and applications All chapters are contributed by world class and prominent Deming speakers who ve contributed their cutting edge research and developments to the community Volume 2 covers Biomarkers in Drug Development Time To Event Data Analysis and Methods and emerging development in biopharmaceutical biostatistics This book aims to booster research education and training in biostatistics and in biopharmaceutical research and development

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Biostatistics in Biopharmaceutical Research and Development Ding-Geng Chen, 2025-01-28

Design and Analysis of Subgroups with Biopharmaceutical Applications Naitee Ting, Joseph C. Cappelleri, Shuyen Ho, (Din) Ding-Geng Chen, 2020-05-01 This book provides an overview of the theories and applications on subgroups in the biopharmaceutical industry Drawing from a range of expert perspectives in academia and industry this collection offers an overarching dialogue about recent advances in biopharmaceutical applications novel statistical and methodological developments and potential future directions The volume covers topics in subgroups in clinical trial design subgroup identification and personalized medicine and general issues in subgroup analyses including regulatory ones Included chapters present current methods theories and case applications in the diverse field of subgroup application and analysis Offering timely perspectives from a range of authoritative sources the volume is designed to have wide appeal to professionals in the pharmaceutical industry and to graduate students and researchers in academe and government

Biopharmaceutical Applied Statistics Symposium Karl E. Peace, Ding-Geng Chen, Sandeep Menon, 2018-08-20 This BASS book Series publishes selected high quality papers reflecting recent advances in the design and biostatistical analysis of biopharmaceutical experiments particularly biopharmaceutical clinical trials The papers were selected from invited presentations at the Biopharmaceutical Applied Statistics Symposium BASS which was founded by the first Editor in 1994 and has since become the premier international conference in biopharmaceutical statistics The primary aims of the BASS are 1 to raise funding to support graduate students in biostatistics programs and 2 to provide an opportunity for professionals engaged in pharmaceutical drug research and development to share insights into solving the problems they encounter The BASS book series is initially divided into three volumes addressing 1 Design of Clinical Trials 2 Biostatistical Analysis of Clinical Trials and 3 Pharmaceutical Applications This book is the first of the 3 volumebook series The topics covered include A Statistical Approach to Clinical Trial Simulations Comparison of Statistical Analysis Methods Using Modeling and Simulation for Optimal Protocol Design Adaptive Trial Design in Clinical Research Best Practices and Recommendations for Trial Simulations in the Context of Designing Adaptive Clinical Trials Designing and Analyzing Recurrent Event Data Trials Bayesian Methodologies for Response Adaptive Allocation Addressing High Placebo Response in Neuroscience Clinical Trials Phase I Cancer Clinical Trials Data Monitoring Structure for Clinical Trials and Sequential Monitoring Procedures

Design and Data Analysis for Multiregional Clinical Trials Theory and Practice Adaptive Group Sequential Multi regional Outcome Studies in Vaccines Development and Validation of Patient reported Outcomes Interim Analysis of Survival Trials Group Sequential Analyses and Conditional Power A Non proportional Hazards Perspective Contemporary Biostatistics with Biopharmaceutical Applications Lanju Zhang, Ding-Geng (Din) Chen, Hongmei Jiang, Gang Li, Hui Quan, 2019-07-11 This edited volume presents current research in biostatistics with emphasis on biopharmaceutical applications Featuring contributions presented at the 2017 ICSA Applied Statistics Symposium held in Chicago IL on June 25 to 28 2017 this book explores timely topics that have a high potential impact on statistical methodology and future research in biostatistics and biopharmaceuticals The theme of this conference was Statistics for a New Generation Challenges and Opportunities in recognition of the advent of a new generation of statisticians The conference attracted statisticians working in academia government and industry domestic and international statisticians From the conference the editors selected 28 high quality presentations and invited the speakers to prepare full chapters for this book These contributions are divided into four parts Part I Biostatistical Methodology Part II Statistical Genetics and Bioinformatics Part III Regulatory Statistics and Part IV Biopharmaceutical Research and Applications Featuring contributions on topics such as statistics in genetics bioinformatics biostatistical methodology and statistical computing this book is beneficial to researchers academics practitioners and policy makers in biostatistics and biopharmaceuticals Cancer Clinical Trials Stephen L. George, Xiaofei Wang, Herbert Pang, 2016-08-19 Cancer Clinical Trials Current and Controversial Issues in Design and Analysis provides statisticians with an understanding of the critical challenges currently encountered in oncology trials Well known statisticians from academic institutions regulatory and government agencies such as the U S FDA and National Cancer Institute and the pharmaceutical industry share their extensive experiences in cancer clinical trials and present examples taken from actual trials The book covers topics that are often perplexing and sometimes controversial in cancer clinical trials Most of the issues addressed are also important for clinical trials in other settings After discussing general topics the book focuses on aspects of early and late phase clinical trials It also explores personalized medicine including biomarker based clinical trials adaptive clinical trial Phase II Clinical Development of New Drugs Naitee Ting, Ding-Geng designs and dynamic treatment regimes Chen, Shuyen Ho, Joseph C. Cappelleri, 2017-04-08 This book focuses on how to appropriately plan and develop a Phase II program and how to design Phase II clinical trials and analyze their data It provides a comprehensive overview of the entire drug development process and highlights key questions that need to be addressed for the successful execution of Phase II so as to increase its success in Phase III and for drug approval Lastly it warns project team members of the common potential pitfalls and offers tips on how to avoid them **Biopharmaceutical Applied Statistics Symposium** Karl E. Peace, Ding-Geng Chen, Sandeep Menon, 2018-08-21 This BASS book Series publishes selected high quality papers reflecting recent advances in the design and biostatistical analysis of biopharmaceutical experiments particularly biopharmaceutical

clinical trials The papers were selected from invited presentations at the Biopharmaceutical Applied Statistics Symposium BASS which was founded by the first Editor in 1994 and has since become the premier international conference in biopharmaceutical statistics The primary aims of the BASS are 1 to raise funding to support graduate students in biostatistics programs and 2 to provide an opportunity for professionals engaged in pharmaceutical drug research and development to share insights into solving the problems they encounter The BASS book series is initially divided into three volumes addressing 1 Design of Clinical Trials 2 Biostatistical Analysis of Clinical Trials and 3 Pharmaceutical Applications This book is the second of the 3 volume book series The topics covered include Statistical Approaches to the Meta analysis of Randomized Clinical Trials Collaborative Targeted Maximum Likelihood Estimation to Assess Causal Effects in Observational Studies Generalized Tests in Clinical Trials Discrete Time to event and Score based Methods with Application to Composite Endpoint for Assessing Evidence of Disease Activity Free Imputing Missing Data Using a Surrogate Biomarker Analyzing the Incidence of Endometrial Hyperplasia Selected Statistical Issues in Patient reported Outcomes Network Meta analysis Detecting Safety Signals Among Adverse Events in Clinical Trials Applied Meta analysis Using R Treatment of Missing Data in Comparative Effectiveness Research Causal Estimands A Common Language for Missing Data Bayesian Subgroup Analysis with Examples Statistical Methods in Diagnostic Devices A Question Based Approach to the Analysis of Safety Data Analysis of Two stage AdaptiveSeamless Trial Design and Multiplicity Problems in Clinical Trials A Regulatory Perspective

Biopharmaceutical Applied Statistics Symposium Karl E. Peace, Ding-Geng Chen, Sandeep Menon, 2018-09-03 This BASS book Series publishes selected high quality papers reflecting recent advances in the design and biostatistical analysis of biopharmaceutical experiments particularly biopharmaceutical clinical trials The papers were selected from invited presentations at the Biopharmaceutical Applied Statistics Symposium BASS which was founded by the first Editor in 1994 and has since become the premier international conference in biopharmaceutical statistics The primary aims of the BASS are 1 to raise funding to support graduate students in biostatistics programs and 2 to provide an opportunity for professionals engaged in pharmaceutical drug research and development to share insights into solving the problems they encounter The BASS book series is initially divided into three volumes addressing 1 Design of Clinical Trials 2 Biostatistical Analysis of Clinical Trials and 3 Pharmaceutical Applications This book is the third of the 3 volume book series The topics covered include Targeted Learning of Optimal Individualized Treatment Rules under Cost Constraints Uses of Mixture Normal Distribution in Genomics and Otherwise Personalized Medicine Design Considerations Adaptive Biomarker Subpopulation and Tumor Type Selection in Phase III Oncology Trials High Dimensional Data in Genomics Synergy or Additivity The Importance of Defining the Primary Endpoint Full Bayesian Adaptive Dose Finding Using Toxicity Probability Interval TPI Alpha recycling for the Analyses of Primary and Secondary Endpoints of Clinical Trials Expanded Interpretations of Results of Carcinogenicity Studies of Pharmaceuticals Randomized Clinical Trials for Orphan Drug Development Mediation Modeling in

Randomized Trials with Non normal Outcome Variables Statistical Considerations in Using Images in Clinical Trials Interesting Applications over 30 Years of Consulting Uncovering Fraud Misconduct and OtherData Quality Issues in Clinical Trials Development and Evaluation of High Dimensional Prognostic Models and Design and Analysis of Biosimilar Studies

Biopharmaceutical Seguential Statistical Applications Karl E. Peace, 1992-03-25 Focusing on group seguential procedures summarizes the sequential statistical methods used in anticancer antiviral cardiovascular and gastrointestinal drug research and screening The clinical and preclinical applications are mainly presented as case studies many of which Encyclopedia of Biopharmaceutical Statistics - Four Volume Set Shein-Chung form part of New Drug Chow, 2018-09-03 Since the publication of the first edition in 2000 there has been an explosive growth of literature in biopharmaceutical research and development of new medicines This encyclopedia 1 provides a comprehensive and unified presentation of designs and analyses used at different stages of the drug development process 2 gives a well balanced summary of current regulatory requirements and 3 describes recently developed statistical methods in the pharmaceutical sciences Features of the Fourth Edition 1 78 new and revised entries have been added for a total of 308 chapters and a fourth volume has been added to encompass the increased number of chapters 2 Revised and updated entries reflect changes and recent developments in regulatory requirements for the drug review approval process and statistical designs and methodologies 3 Additional topics include multiple stage adaptive trial design in clinical research translational medicine design and analysis of biosimilar drug development big data analytics and real world evidence for clinical research and development 4 A table of contents organized by stages of biopharmaceutical development provides easy access to relevant topics About the Editor Shein Chung Chow Ph D is currently an Associate Director Office of Biostatistics U S Food and Drug Administration FDA Dr Chow is an Adjunct Professor at Duke University School of Medicine as well as Adjunct Professor at Duke NUS Singapore and North Carolina State University Dr Chow is the Editor in Chief of the Journal of Biopharmaceutical Statistics and the Chapman Hall CRC Biostatistics Book Series and the author of 28 books and over 300 methodology papers He was elected Fellow of the American Statistical Association in 1995 **Handbook of Multiple Comparisons** Xinping Cui, Thorsten Dickhaus, Ying Ding, Jason C. Hsu, 2021-11-17 Written by experts that include originators of some key ideas chapters in the Handbook of Multiple Testing cover multiple comparison problems big and small with guidance toward error rate control and insights on how principles developed earlier can be applied to current and emerging problems Some highlights of the coverages are as follows Error rate control is useful for controlling the incorrect decision rate Chapter 1 introduces Tukey's original multiple comparison error rates and point to how they have been applied and adapted to modern multiple comparison problems as discussed in the later chapters Principles endure While the closed testing principle is more familiar Chapter 4 shows the partitioning principle can derive confidence sets for multiple tests which may become important as the profession goes beyond making decisions based on p values Multiple comparisons of treatment efficacy often involve

multiple doses and endpoints Chapter 12 on multiple endpoints explains how different choices of endpoint types lead to different multiplicity adjustment strategies while Chapter 11 on the MCP Mod approach is particularly useful for dose finding To assess efficacy in clinical trials with multiple doses and multiple endpoints the reader can see the traditional approach in Chapter 2 the Graphical approach in Chapter 5 and the multivariate approach in Chapter 3 Personalized precision medicine based on targeted therapies already a reality naturally leads to analysis of efficacy in subgroups Chapter 13 draws attention to subtle logical issues in inferences on subgroups and their mixtures with a principled solution that resolves these issues This chapter has implication toward meeting the ICHE9R1 Estimands requirement Besides the mere multiple testing methodology itself the handbook also covers related topics like the statistical task of model selection in Chapter 7 or the estimation of the proportion of true null hypotheses or in other words the signal prevalence in Chapter 8 It also contains decision theoretic considerations regarding the admissibility of multiple tests in Chapter 6 The issue of selected inference is addressed in Chapter 9 Comparison of responses can involve millions of voxels in medical imaging or SNPs in genome wide association studies GWAS Chapter 14 and Chapter 15 provide state of the art methods for large scale simultaneous inference in these settings Design and Analysis of Subgroups with Biopharmaceutical Applications, 2020 This book provides an overview of the theories and applications on subgroups in the biopharmaceutical industry Drawing from a range of expert perspectives in academia and industry this collection offers an overarching dialogue about recent advances in biopharmaceutical applications novel statistical and methodological developments and potential future directions. The volume covers topics in subgroups in clinical trial design subgroup identification and personalized medicine and general issues in subgroup analyses including regulatory ones Included chapters present current methods theories and case applications in the diverse field of subgroup application and analysis Offering timely perspectives from a range of authoritative sources the volume is designed to have wide appeal to professionals in the pharmaceutical industry and to graduate students and Clinical Trial Methodology Karl E. Peace, Ding-Geng (Din) Chen, 2010-07-20 researchers in academe and government Now viewed as its own scientific discipline clinical trial methodology encompasses the methods required for the protection of participants in a clinical trial and the methods necessary to provide a valid inference about the objective of the trial Drawing from the authors courses on the subject as well as the first author's more than 30 years wor **Handbook of Statistical** Methods for Randomized Controlled Trials KyungMann Kim, Frank Bretz, Ying Kuen K. Cheung, Lisa V. Hampson, 2021-08-23 Statistical concepts provide scientific framework in experimental studies including randomized controlled trials In order to design monitor analyze and draw conclusions scientifically from such clinical trials clinical investigators and statisticians should have a firm grasp of the requisite statistical concepts The Handbook of Statistical Methods for Randomized Controlled Trials presents these statistical concepts in a logical sequence from beginning to end and can be used as a textbook in a course or as a reference on statistical methods for randomized controlled trials Part I

provides a brief historical background on modern randomized controlled trials and introduces statistical concepts central to planning monitoring and analysis of randomized controlled trials Part II describes statistical methods for analysis of different types of outcomes and the associated statistical distributions used in testing the statistical hypotheses regarding the clinical questions Part III describes some of the most used experimental designs for randomized controlled trials including the sample size estimation necessary in planning Part IV describe statistical methods used in interim analysis for monitoring of efficacy and safety data Part V describe important issues in statistical analyses such as multiple testing subgroup analysis competing risks and joint models for longitudinal markers and clinical outcomes Part VI addresses selected miscellaneous topics in design and analysis including multiple assignment randomization trials analysis of safety outcomes non inferiority trials incorporating historical data and validation of surrogate outcomes **Clinical Trial Data Analysis Using R and SAS** Ding-Geng (Din) Chen, Karl E. Peace, Pinggao Zhang, 2017-06-01 Review of the First Edition The goal of this book as stated by the authors is to fill the knowledge gap that exists between developed statistical methods and the applications of these methods Overall this book achieves the goal successfully and does a nice job I would highly recommend it The example based approach is easy to follow and makes the book a very helpful desktop reference for many biostatistics methods Journal of Statistical Software Clinical Trial Data Analysis Using R and SAS Second Edition provides a thorough presentation of biostatistical analyses of clinical trial data with step by step implementations using R and SAS The book s practical detailed approach draws on the authors 30 years experience in biostatistical research and clinical development The authors develop step by step analysis code using appropriate R packages and functions and SAS PROCS which enables readers to gain an understanding of the analysis methods and R and SAS implementation so that they can use these two popular software packages to analyze their own clinical trial data What's New in the Second Edition Adds SAS programs along with the R programs for clinical trial data analysis Updates all the statistical analysis with updated R packages Includes correlated data analysis with multivariate analysis of variance Applies R and SAS to clinical trial data from hypertension duodenal ulcer beta blockers familial andenomatous polyposis and breast cancer trials Covers the biostatistical aspects of various clinical trials including treatment comparisons time to event endpoints longitudinal clinical trials and bioequivalence trials Cluster Randomised Trials Richard J. Hayes, Lawrence H. Moulton, 2017-07-06 Cluster Randomised Trials Second Edition discusses the design conduct and analysis of trials that randomise groups of individuals to different treatments It explores the advantages of cluster randomisation with special attention given to evaluating the effects of interventions against infectious diseases Avoiding unnecessary mathematical detail the book covers basic concepts underlying the use of cluster randomisation such as direct indirect and total effects In the time since the publication of the first edition the use of cluster randomised trials CRTs has increased substantially which is reflected in the updates to this edition There are greatly expanded sections on randomisation sample size estimation and alternative designs including new material on stepped

wedge designs There is a new section on handling ordinal outcome data and an appendix with descriptions and or generating code of the example data sets Although the book mainly focuses on medical and public health applications it shows that the rigorous evidence of intervention effects provided by CRTs has the potential to inform public policy in a wide range of other areas The book encourages readers to apply the methods to their own trials reproduce the analyses presented and explore alternative approaches Clinical Trial Optimization Using R Alex Dmitrienko, Erik Pulkstenis, 2017-08-10 Clinical Trial Optimization Using R explores a unified and broadly applicable framework for optimizing decision making and strategy selection in clinical development through a series of examples and case studies It provides the clinical researcher with a powerful evaluation paradigm as well as supportive R tools to evaluate and select among simultaneous competing designs or analysis options It is applicable broadly to statisticians and other quantitative clinical trialists who have an interest in optimizing clinical trials clinical trial programs or associated analytics and decision making This book presents in depth the Clinical Scenario Evaluation CSE framework and discusses optimization strategies including the quantitative assessment of tradeoffs A variety of common development challenges are evaluated as case studies and used to show how this framework both simplifies and optimizes strategy selection Specific settings include optimizing adaptive designs multiplicity and subgroup analysis strategies and overall development decision making criteria around Go No Go After this book the reader will be equipped to extend the CSE framework to their particular development challenges as well

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