Principles of scientific writing in medical research

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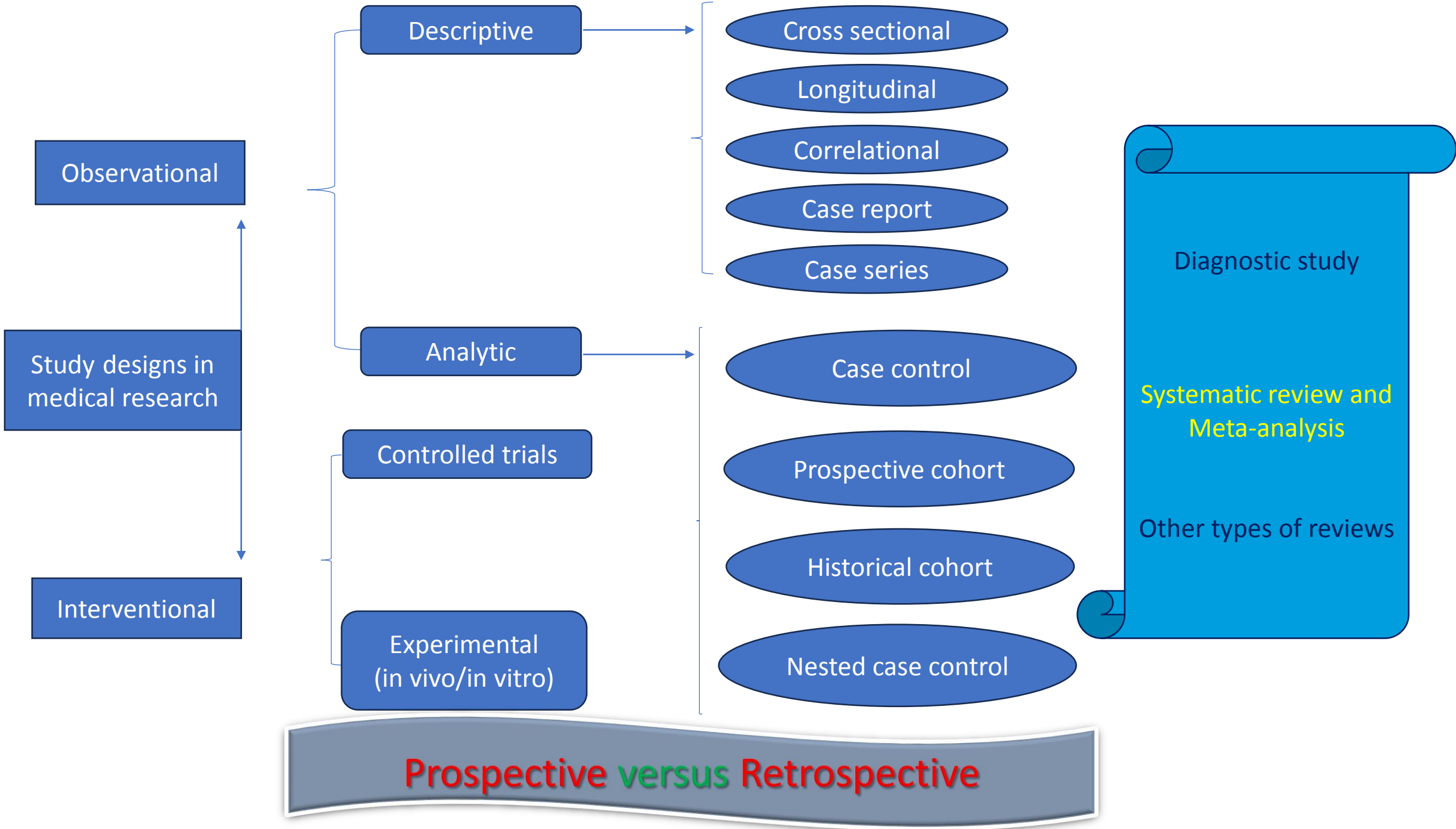
A review of contents

- Original articles
  - Observational studies
  - Interventional studies
- Case reports/series
- What makes good writing?

How to write a scientific paper?

- Study design
- Instructions for authors of the journal
- The author’s innovation


Study designs in medical research
Observational
Interventional
Descriptive
Analytic
Controlled trials
Experimental (in vivo/in vitro)
Cross sectional
Longitudinal
Correlational
Case report
Case series
Case control
Prospective cohort
Historical cohort
Nested case control
Diagnostic study
Systematic review and Meta-analysis
Other types of reviews
Prospective versus Retrospective

How to write an original article?

- Results
- Method
- Introduction/Discussion
- Conclusion
- References
- Abstract
- Title
- Others(Author's name, Affiliations, Decelerations)

STROBE Statement
Strengthening the reporting of observational studies in epidemiology

CARE
case report guidelines

What makes good writing?

- Dysregulation of physiologic microRNA (miRNA) activity has been shown to play an important role in tumor inhibition and progression, including gliomagenesis. Therefore, molecular species that can regulate miRNA activity on their target RNAs without affecting the expression of relevant mature miRNAs may play equally relevant roles in cancer.

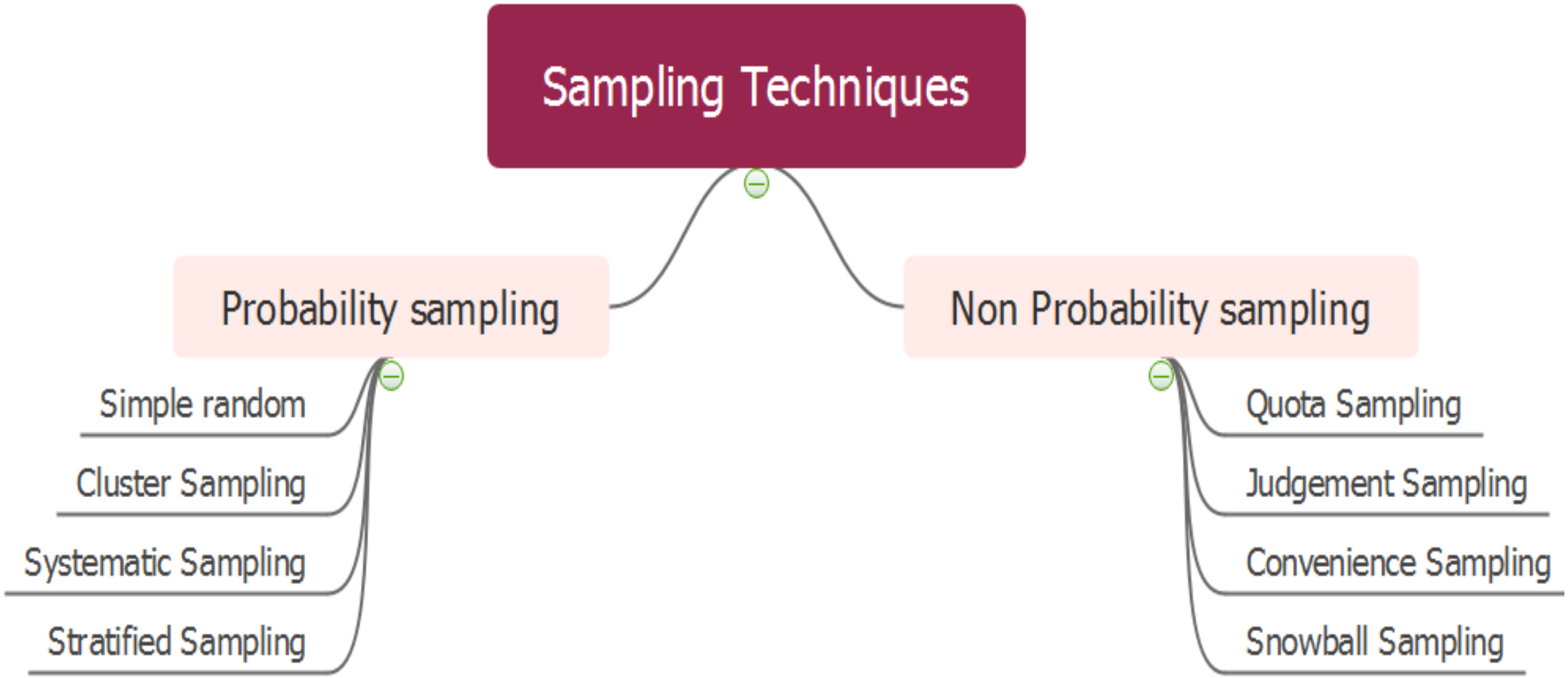
- Changes in microRNA expression play a role in cancer, including glioma. Therefore, events that disrupt microRNAs from binding to their target RNAs may also promote cancer.

What makes good writing?

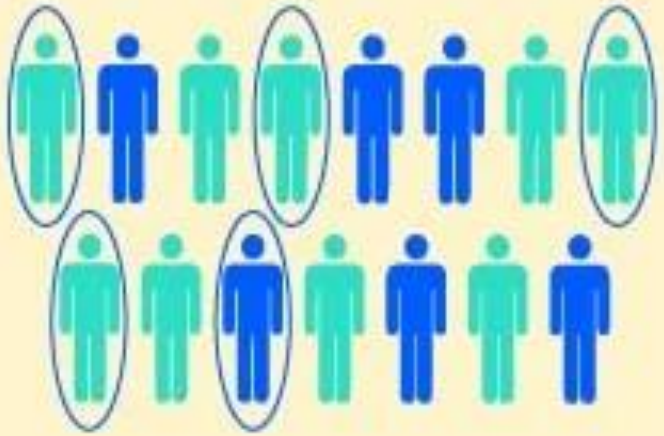
- Complex ideas don’t require complex language.
- Cut unnecessary words and phrases.
- Don’t use unnecessary jargons & acronyms.
- Change repetitive words or phrases.
- Eliminate negative!
- Use the active voice (subject + verb + object).
- Use past tense for completed actions.
- Use strong verbs; don’t kill verbs by turning them to nouns.
- Minimize the distance between subject and the main verb.

Method

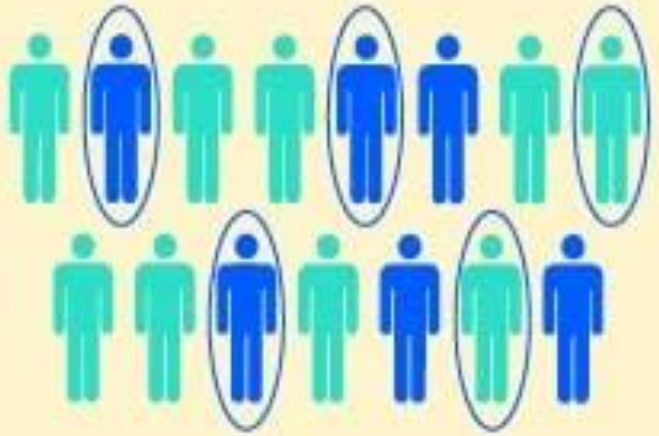
- Study design and setting(location, time,…)
- Study population/ Target population
- Inclusion and exclusion criteria
- Sample size and sampling vs. census method


Sampling Techniques
Probability sampling
Simple random
Cluster Sampling
Systematic Sampling
Stratified Sampling
Non Probability sampling
Quota Sampling
Judgement Sampling
Convenience Sampling
Snowball Sampling

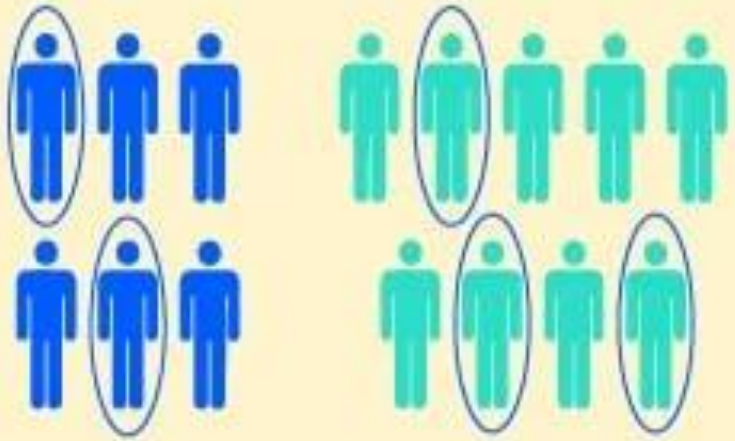
SIMPLE RANDOM SAMPLE



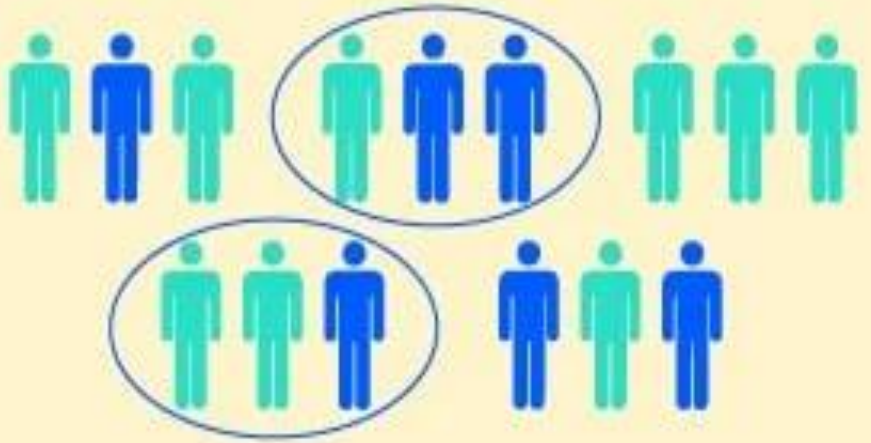
SYSTEMATIC SAMPLE



STRATIFIED SAMPLE



CLUSTER SAMPLE



Method

- Study design and setting(location, time,…)
- Study population/ Target population
- Inclusion and exclusion criteria
- Sample size and sampling vs. census method
- Data collection
- Statistical analysis
- Ethical consideration

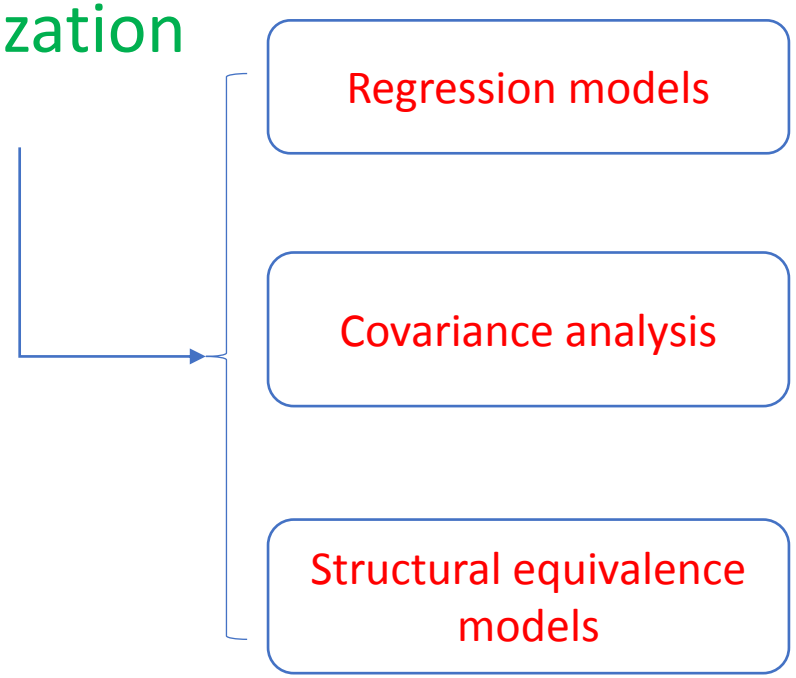
Data Collection

- Based on study design and objective
- Questionnaire based
- Checklist based
- Laboratory based
- Mixed

What? How? Who? Why? Where? When?

How to control confounding variables?

- Matching
- Restriction
- Blocking
- Randomization
- Analysis

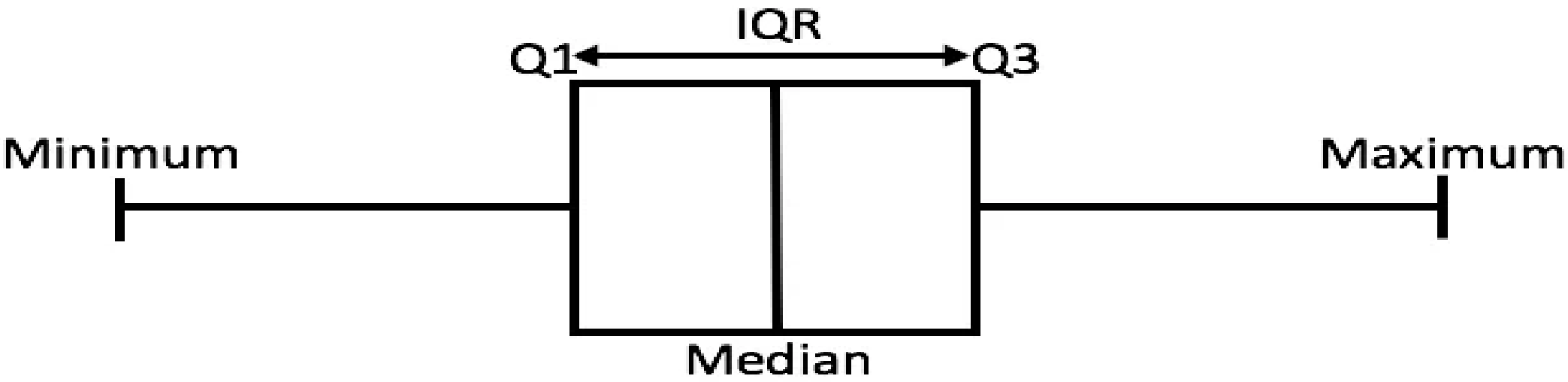


Statistical Analysis

- Descriptive statistics

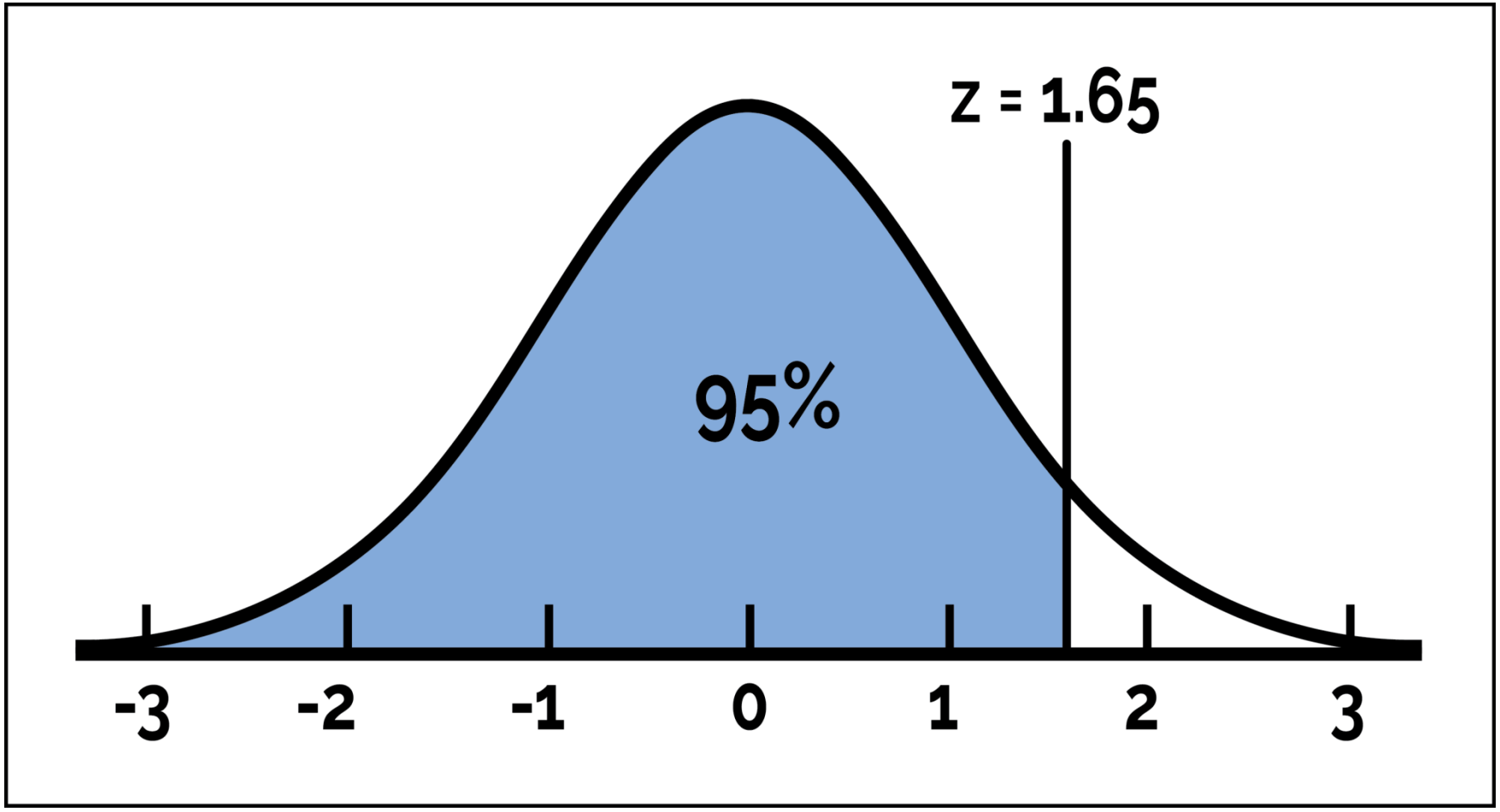
  Frequency, Percentage, Median, IQR, Mean, SD, Mean Difference (95%CI)

  95% CI=Mean±2SE → $\frac{\sigma}{\sqrt{n}}$



Statistical Analysis

- Descriptive statistics
- Are data normal distributed?



Statistical Analysis

- Descriptive statistics
- Are data normal distributed?

Statistical Analysis

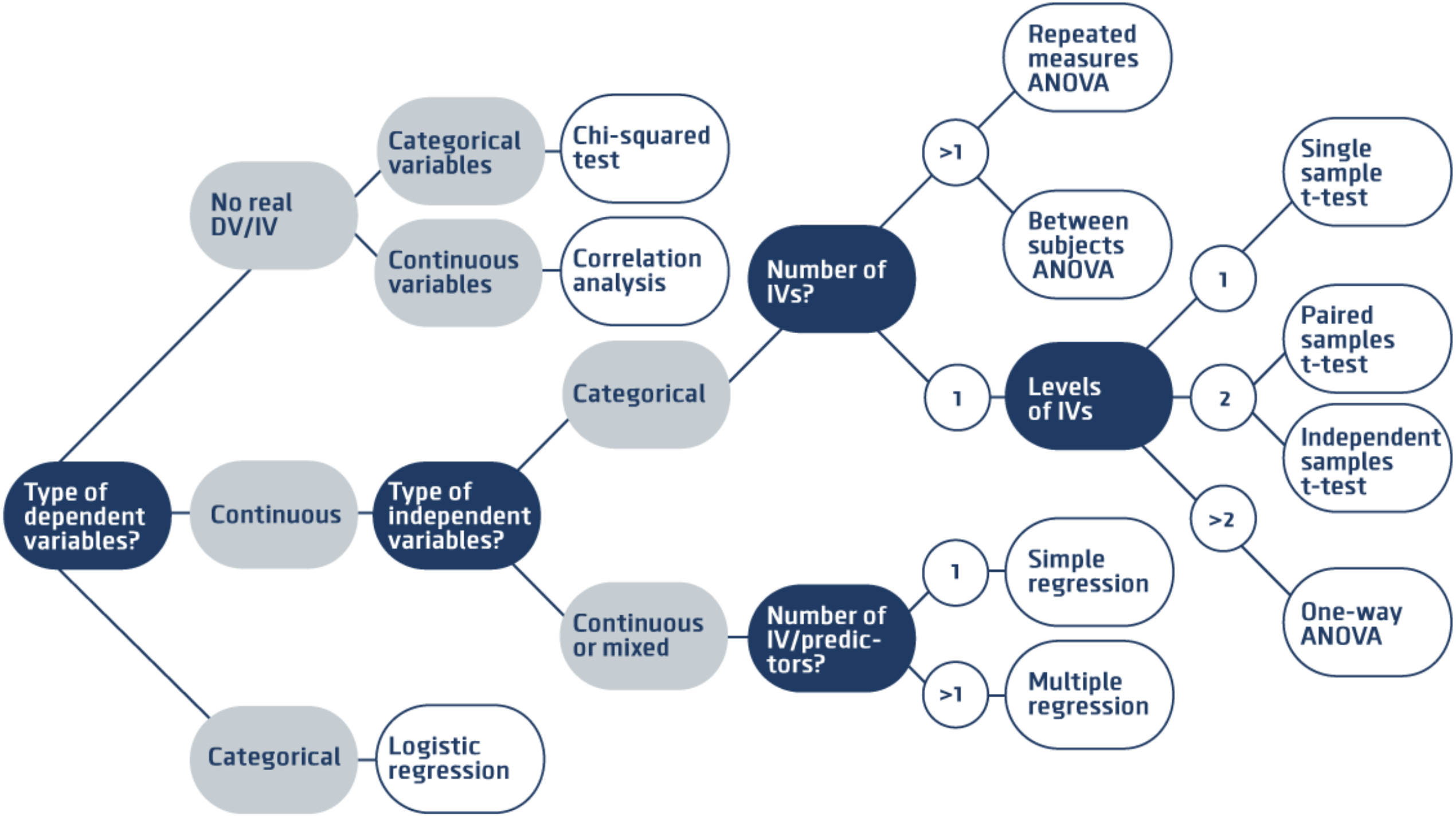
- Inferential statistics
  - based on study design, type of variables, normal distribution of variables, pairedness of variables, univariate/ multivariate analysis, time event analysis (survival analysis)

  - Statistical test

- Statistical Software details and probability cut off

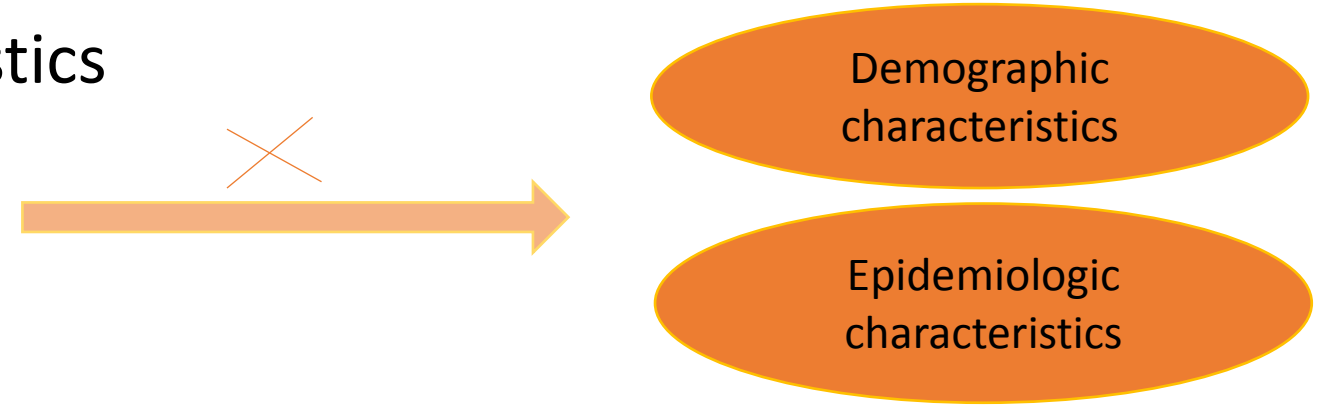
Ethical consideration

- Ethical codes
- Informed consent
- Confidentiality and privacy
- Ethical considerations in animal studies


Type of dependent variables?
No real DV/IV
Categorical variables
Chi-squared test
Continuous variables
Correlation analysis
Continuous
Type of independent variables?
Categorical
Number of IVs?
>1
Repeated measures ANOVA
Between subjects ANOVA
1
Levels of IVs
1
Single sample t-test
2
Paired samples t-test
Independent samples t-test
>2
One-way ANOVA
Continuous or mixed
Number of IV/predic-tors?
1
Simple regression
>1
Multiple regression
Categorical
Logistic regression

Results

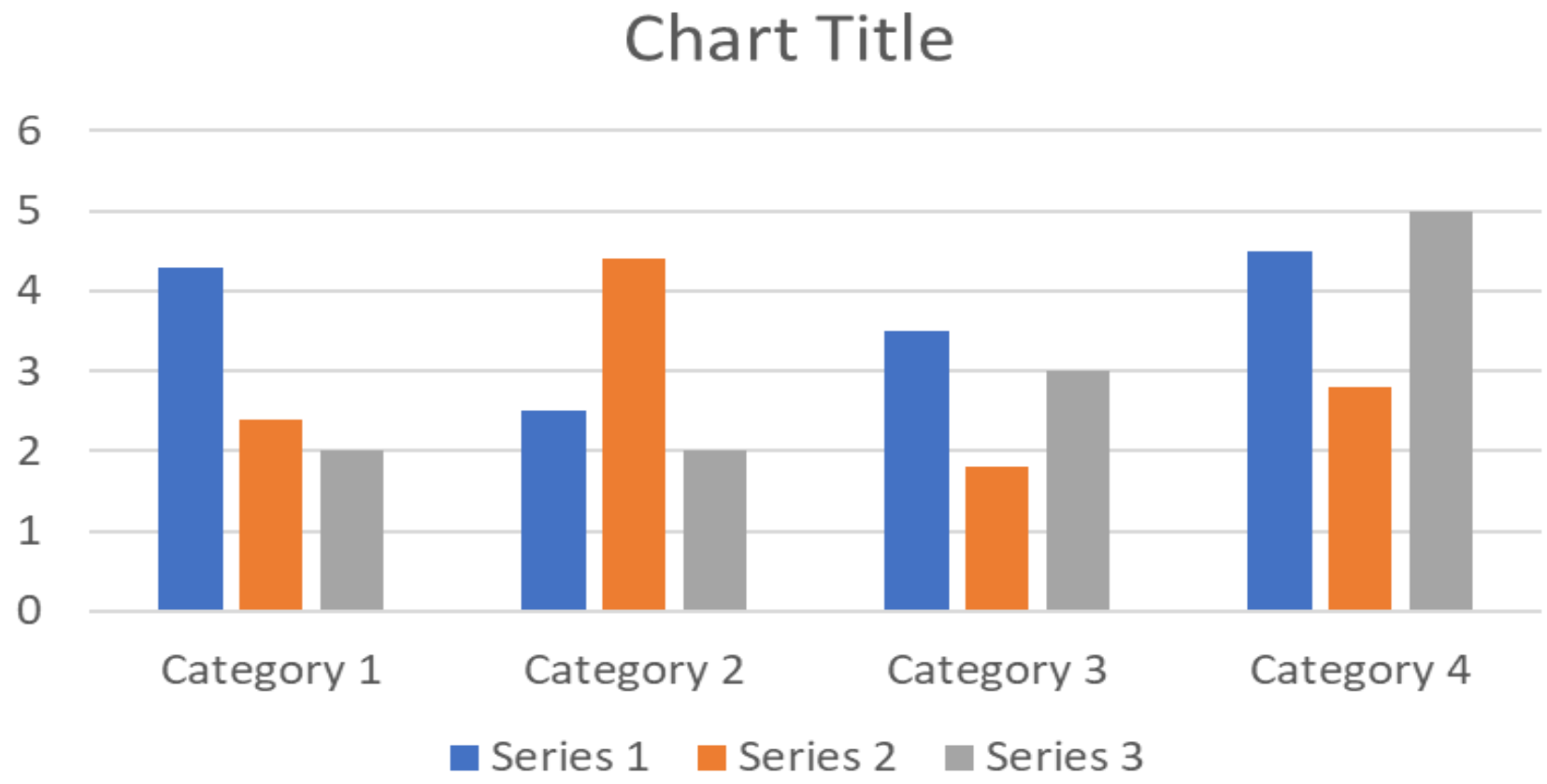
- Baseline characteristics



- Compare main variables
- Be innovative and intelligent to better visualize the data
- Report findings with both descriptive and inferential results

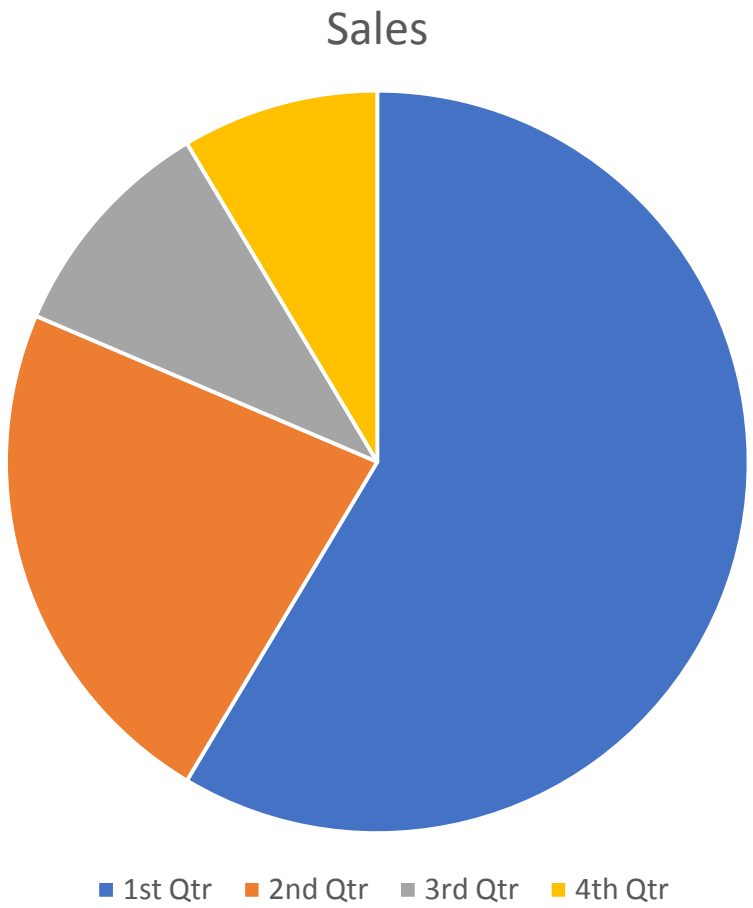
Results

- Be innovative and intelligent to better visualize the data



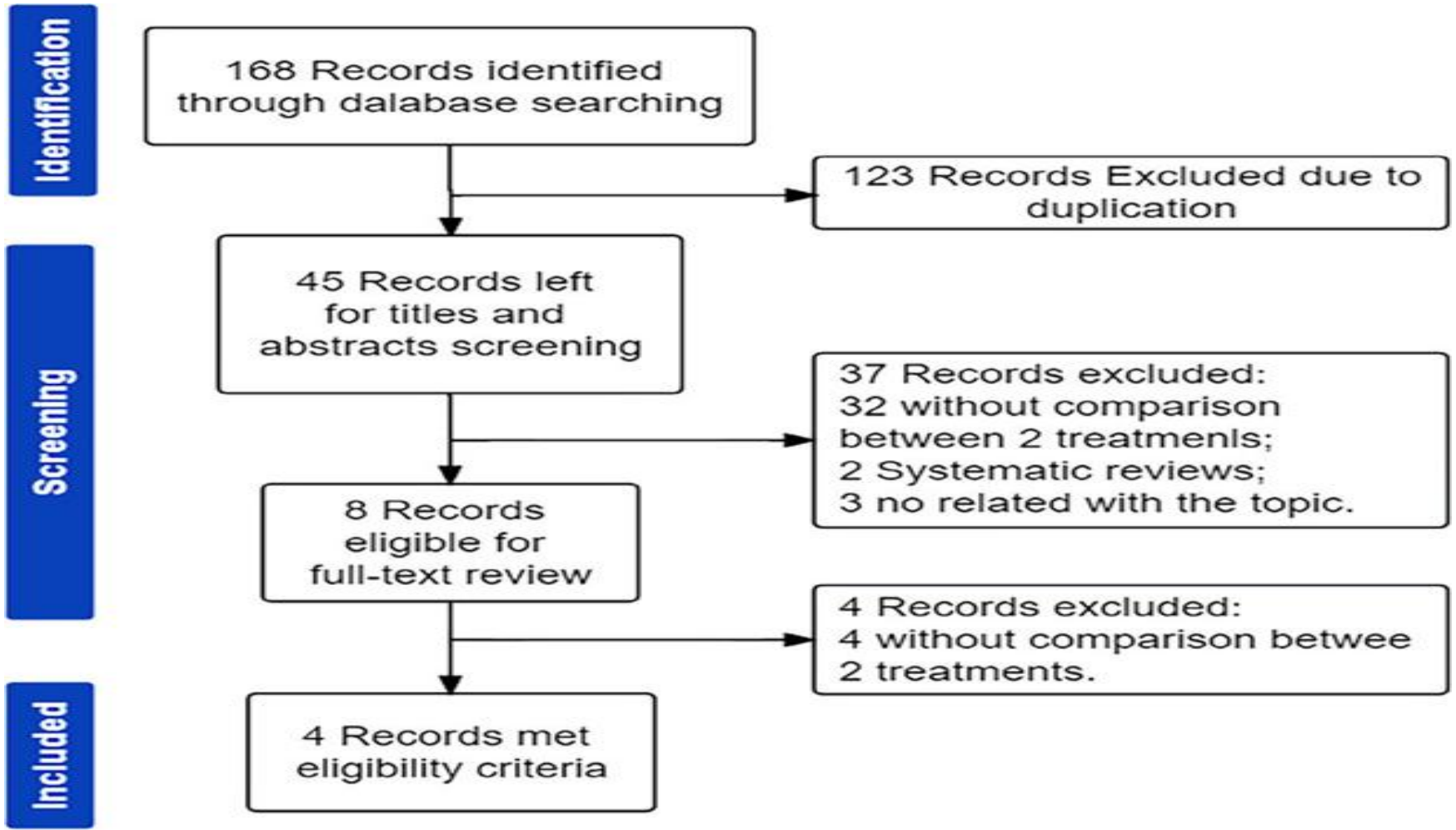
Results

- Be innovative and intelligent to better visualize the data



Results

- Be innovative and intelligent to better visualize the data



Results

- Report findings with both descriptive and inferential results

Table 1. Baseline characteristics and medical history of the patients

Variables	Case (n=104)	Control (n=102)	P value
Baseline characteristics			
Age (years)	43.46±.9.90	43.45±11.48	0.845[a]
Sex			0.839[b]
Male	70(67.3)	70(68.6)	
Female	34(32.7)	32(31.4)	
Educational status			<0.001[b]
Elementary school	71(68.3)	39(38.2)	
Secondary school	27(26.0)	50(49.0)	
University	6(5.7)	13(12.8)	
Body mass index (kg/m^2)	26.56±5.32	27.02±4.53	0.435[a]
Tobacco smoking	53(51.0)	48(47.1)	0.575[b]
Alcohol consumption	15(14.4)	10(9.8)	0.310[b]
Drug abuse	16(15.4)	1(1.0)	<0.001[c]
Medical history			
Interval from HIV diagnosis (weeks)	20.99±32.59	52.82±46.67	<0.001[a]
Current HAART	58(55.8)	99(97.1)	<0.001[b]
Duration of HAART (weeks)	17.45±20.74	53.27±42.23	<0.001[a]
History of oral candidiasis	18(17.3)	0(0)	<0.001[a]
Medications in the last 3 months			
Corticosteroids	2(1.9)	0(0)	0.498[c]
Proton pump inhibitors	0(0)	0(0)	N/A

Values were described with frequency (%) or mean±standard deviation.

HAART: highly active antiretroviral therapy, HIV: human immunodeficiency virus, N/A: not applicable

[a] Independent-samples t test, [b] Chi-square test, [c] Fisher's exact test

Results

- Report findings with both descriptive and inferential results

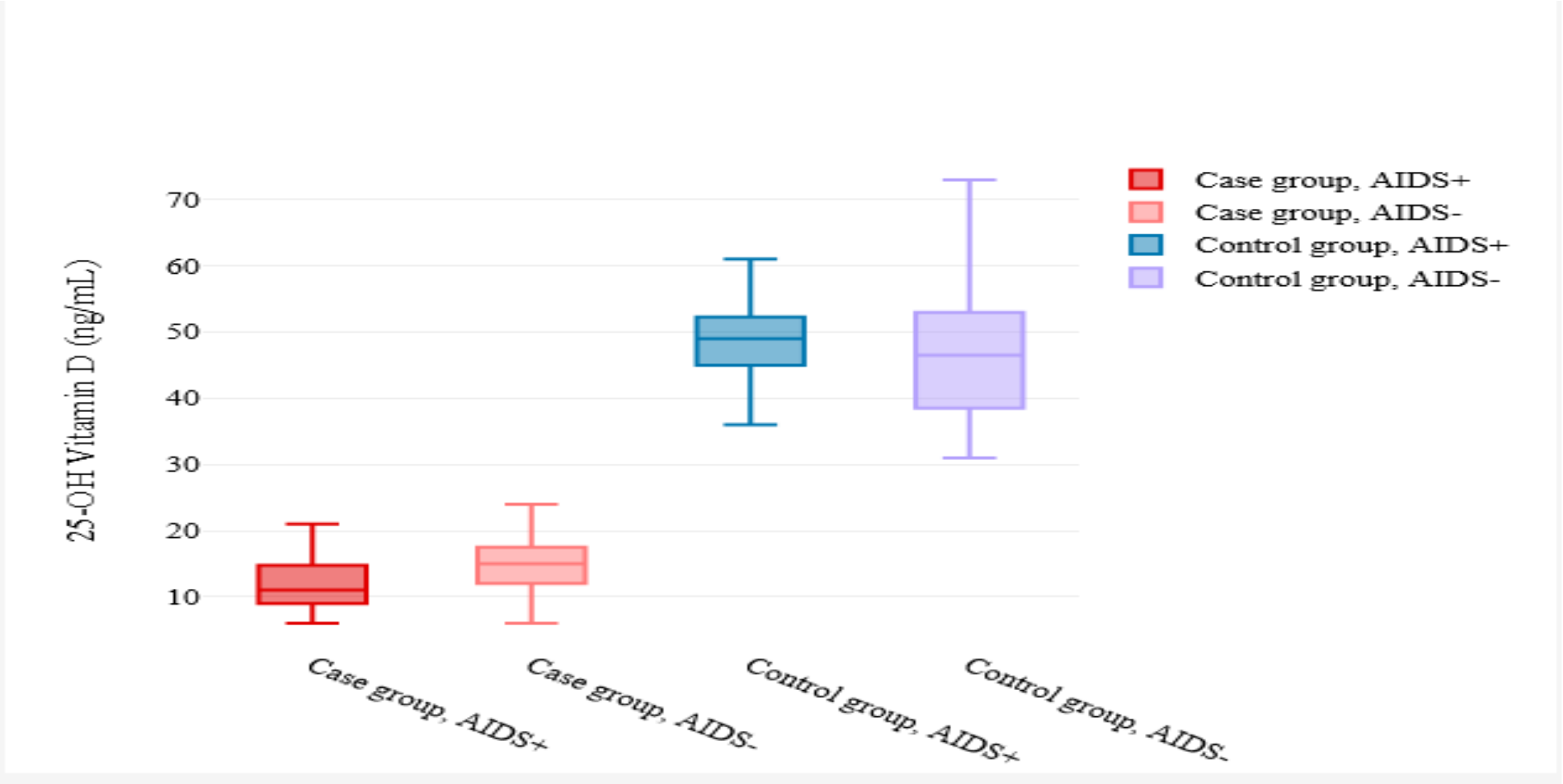


Figure 2- 25-OH Vitamin D3 levels in the case and control groups by AIDS status

What is **OR** and **RR**?

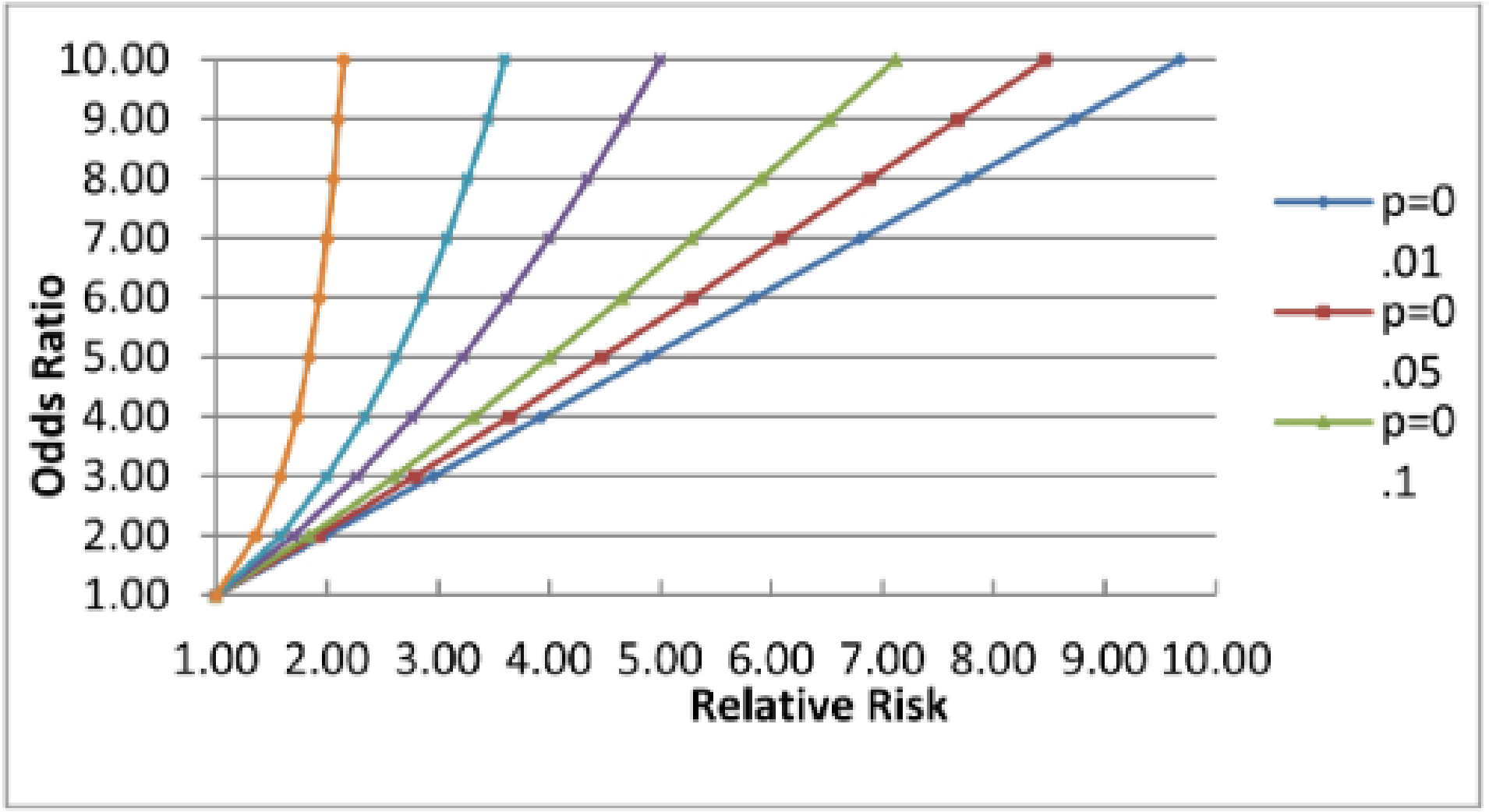
$$OR = \frac{(A/C)}{(B/D)} = \frac{AD}{BC}$$

$$RR = \frac{(A/A+B)}{(C/C+D)}$$

	Disease (Case)	No Disease (Control)
Exposed	A	B
Unexposed	C	D

- A relative risk or odds ratio greater than one indicates an exposure to be harmful, while a value less than one indicates a protective effect.

What is OR and RR?



مرادپور فرهاد، رمضانی رضا. آیا نسبت شانس برآورد مناسبی از خطر نسبی است؟. علوم پزشکی رازی (مجله دانشگاه علوم پزشکی ایران)[Internet]. 1395؛23(143):57-62. Available from: https://sid.ir/paper/10503/fa

Regression models

- Logistic regression

Table 3. Logistic regression analysis to adjust the effect of vitamin D level on oral candidiasis				
	Unadjusted model		Adjusted model	
	OR (95% CI)	P value	OR (95% CI)	P value
Age	0.983 (0.689, 1.508)	0.852	-	-
Sex Male Female	 Reference 0.701 (0.138, 3.546)	0.667	-	-
BMI	0.921 (0.679, 1.367)	0.465	-	-
Educational status Elementary Secondary and above	 Reference 0.067 (0.006, 0.713)	0.025	 Reference 0.032 (0.002, 0.100)	<0.001
Tobacco smoking	0.041 (0.001, 1.723)	0.194	-	-
Alcohol consumption	0.268 (0.068, 1.060)	0.161	-	-
Drug abuse	7.824 (1.862, 32.890)	<0.001	7.330 (0.075, 720.054)	0.395
Interval from HIV diagnosis	0.921 (0.846, 1.003)	0.158	-	-
Current HAART	0.005 (0.001, 0.010)	<0.001	0.005 (0.001, 0.014)	<0.001
History of oral candidiasis	20.589 (19.203, 22.171)	<0.001	20.114 (18.135, 21.957)	<0.001
CD4 count (cells/mm3) <200 >200	 Reference 0.120 (0.001, 0.309)	0.016	 Reference 0.004 (0.001, 0.006)	<0.001
Viral load Undetectable Detectable	 Reference 8.000 (5.402, 13.060)	<0.001	 Reference 12.181 (1.108, 133.392)	<0.001
25-OH Vitamin D_3 level	0.521 (0.411, 0.659)	<0.001	0.011 (0.008, 0.015)	<0.001

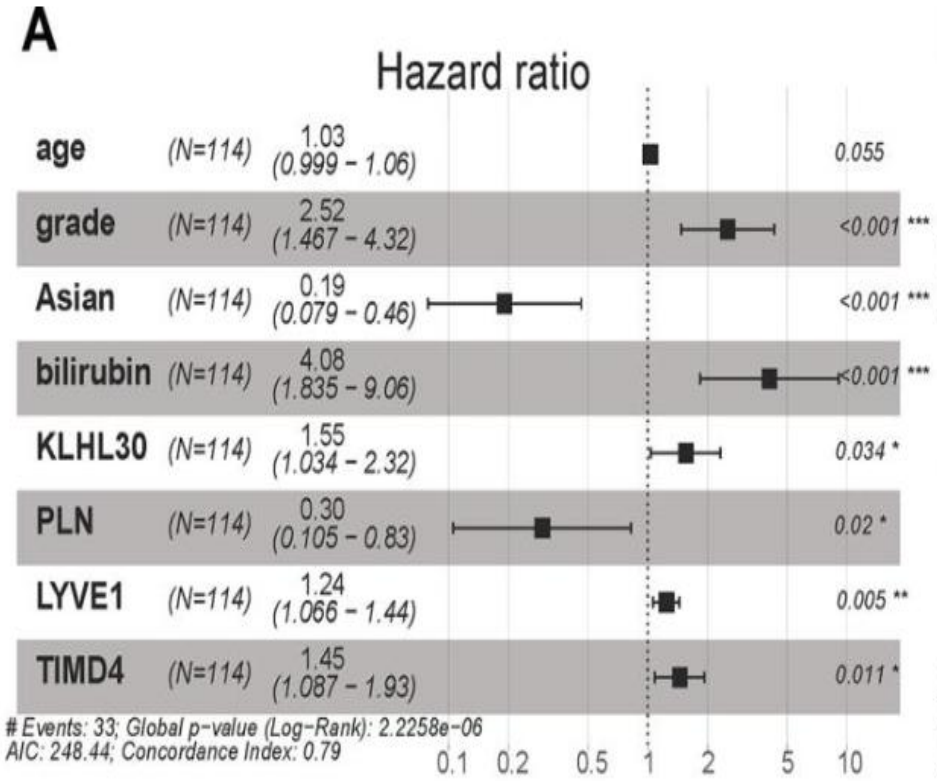
Regression models

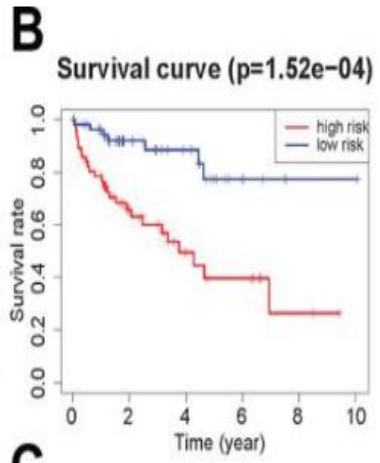
- Linear regression

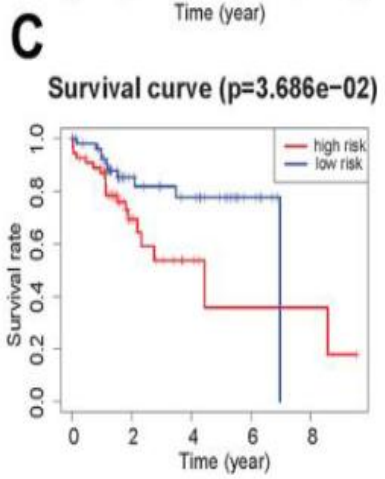
Table 3. Multivariate linear regression model to predict the size of UF

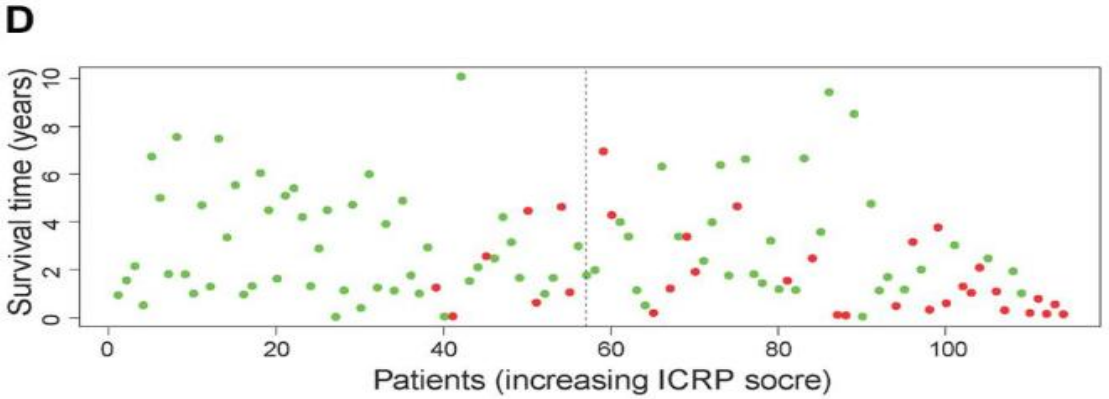
Variables	Regression coefficient	95 % Confidence interval	P-value
Constant	97.540	(44.988, 134.275)	<0.001
Age	-0.931	(-1.657, -0.204)	0.012
Body mass index	-1.153	(-2.349, 0.043)	0.059
Platelet to lymphocyte ratio	0.020	(-0.013, 0.052)	0.237
number of UF	22.418	(16.360, 28.476)	<0.001

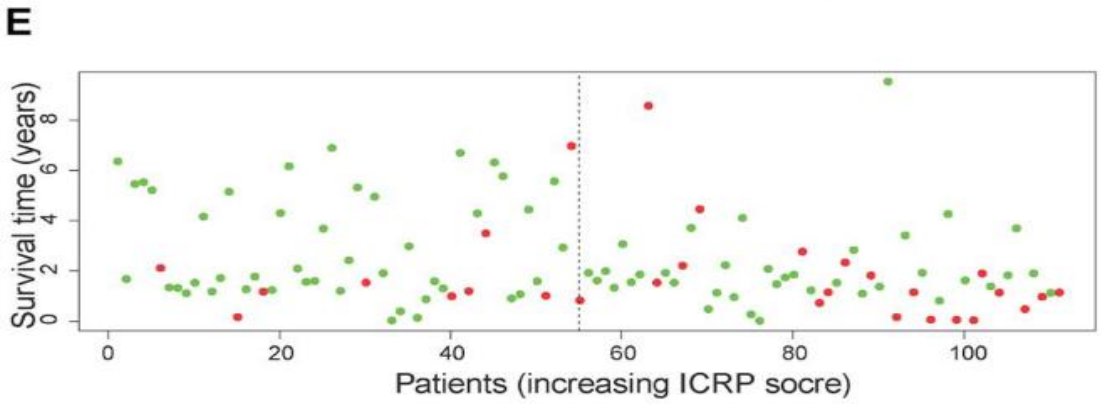
Cox regression











Kong W, Gao M, Jin Y, Huang W, Huang Z, Xie Z. Prognostic model of patients with liver cancer based on tumor stem cell content and immune process. Aging (Albany NY). 2020 Aug 27;12(16):16555-16578. doi: 10.18632/aging.103832. Epub 2020 Aug 27. PMID: 32852285; PMCID: PMC7485734.

How to deal with missing data?

- Omitting
- Analysis imputation
  - Propensity score matching

Discussion

- Key findings

- Interpretation

  Compare your result with the result of previous studies

  Consistent ⟶ Pathophysiology

  Inconsistent ⟶ Adjustments for inconsistencies

- Study limitations

- Suggestions for further studies

Conclusions

- Summarize key points
- Emphasize significance
- Provide closure
- Suggest further implication

Our findings support the non-inferiority of the FluGuard vaccine to the Vaxigrip vaccine regarding immunogenicity. Furthermore, the safety profile of the above vaccines does not differ. In conclusion, the FluGuard vaccine has acceptable immunogenicity and safety for adults aged 18-60. Further studies are required to explore different aspects of FluGuard seasonal influenza vaccines.

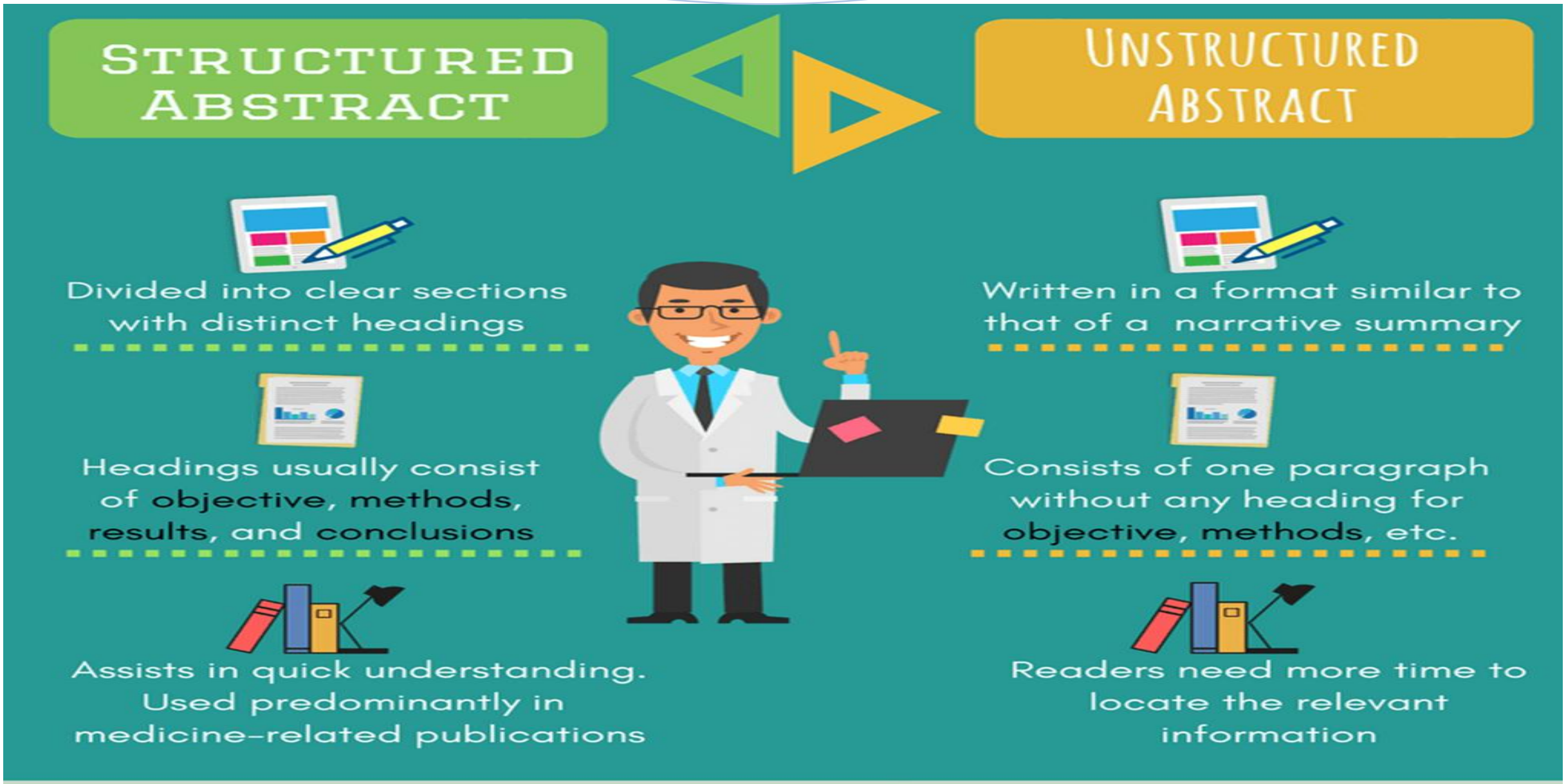
Introduction

- Background
- Objective

What makes good writing?

- Data vs. datum
- Effect vs. affect
- Compare to vs. compare with
- Which vs. that
- Don’t use they/their when subject is singular.
- Use appropriate punctuation to better organize the sentence.
- Use transition words.

Abstract


STRUCTURED ABSTRACT
UNSTRUCTURED ABSTRACT
Divided into clear sections with distinct headings
Written in a format similar to that of a narrative summary
Headings usually consist of objective, methods, results, and conclusions
Consists of one paragraph without any heading for objective, methods, etc.
Assists in quick understanding. Used predominantly in medicine-related publications
Readers need more time to locate the relevant information
enago academy

Title

- Interrogative or Declarative

Pneumonia in a patient with combined variable immunodeficiency: COVID-19 or Pneumocystis Pneumonia?

- Use of punctuations in title
- Unbiased title?

Side effects after COVID-19 vaccination: a comparison between the most common available vaccines in Iran

Menstrual disturbances following COVID-19 vaccination: A probable puzzle about the role of endocrine and immune pathways

Randomized controlled trials

CONSORT checklist 2010 (25 items)

TITLE & ABSTRACT

INTRODUCTION

- Background
- Objectives

METHODS

- Trial design
- Participants
- Interventions
- Outcomes
- Sample size
- Randomization
  - Sequence generation
  - Allocation concealment
  - Implementation
- Blinding (Masking)
- Statistical methods

RESULTS

- Participant flow
- Recruitment
- Baseline data
- Numbers analyzed
- Outcomes and Estimation
- Ancillary analyses
- Harms

DISCUSSION

- Limitations
- Generalisability
- Interpretation

OTHER INFORMATION

- Registration
- Protocol
- Funding

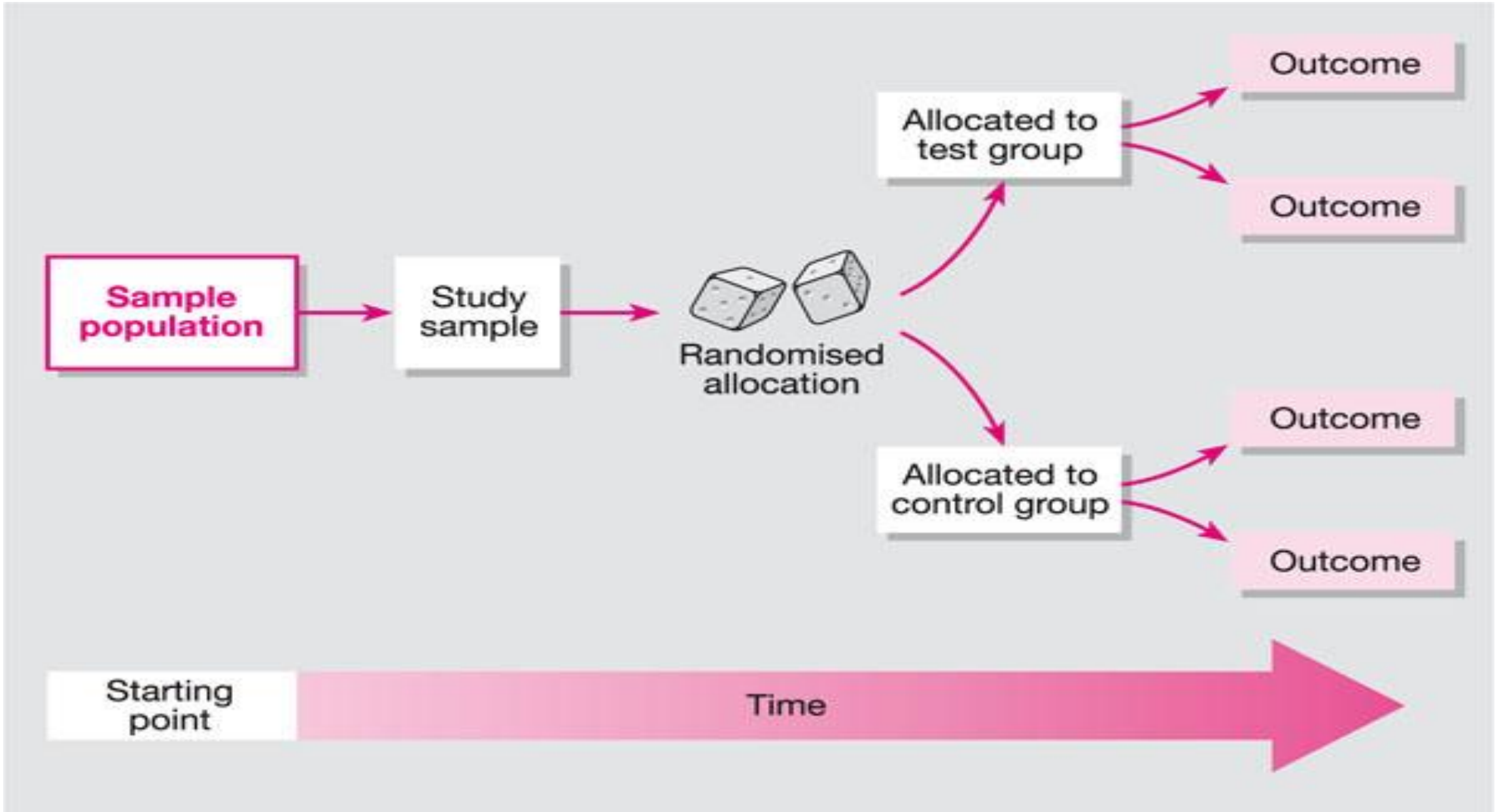
Method (RCT)

- Study design
  - Registry
  - Sampling
  - Randomization
  - Allocation ratio
  - Blinding
- Randomized versus Non-randomized
- Intervention
- Outcome
  - Primary
  - Secondary

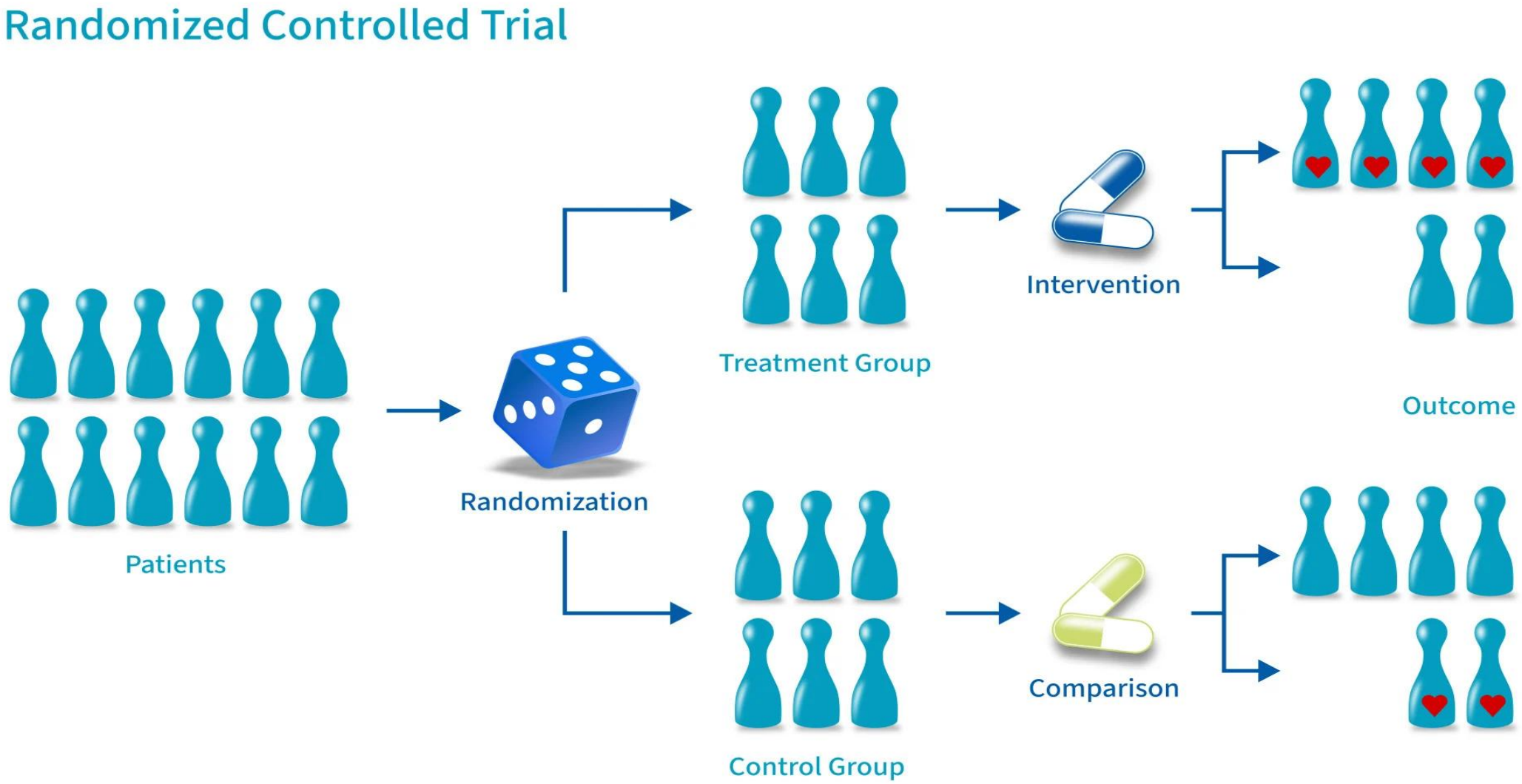
Study design and setting

This double-blind, non-inferiority, randomized controlled trial with two parallel arms was conducted at Labbafinejad Hospital, Tehran, Iran, between October 2022 and February 2023. The study protocol was approved by the Iranian Registry of Clinical Trials (IRCT20210901052358N5). …

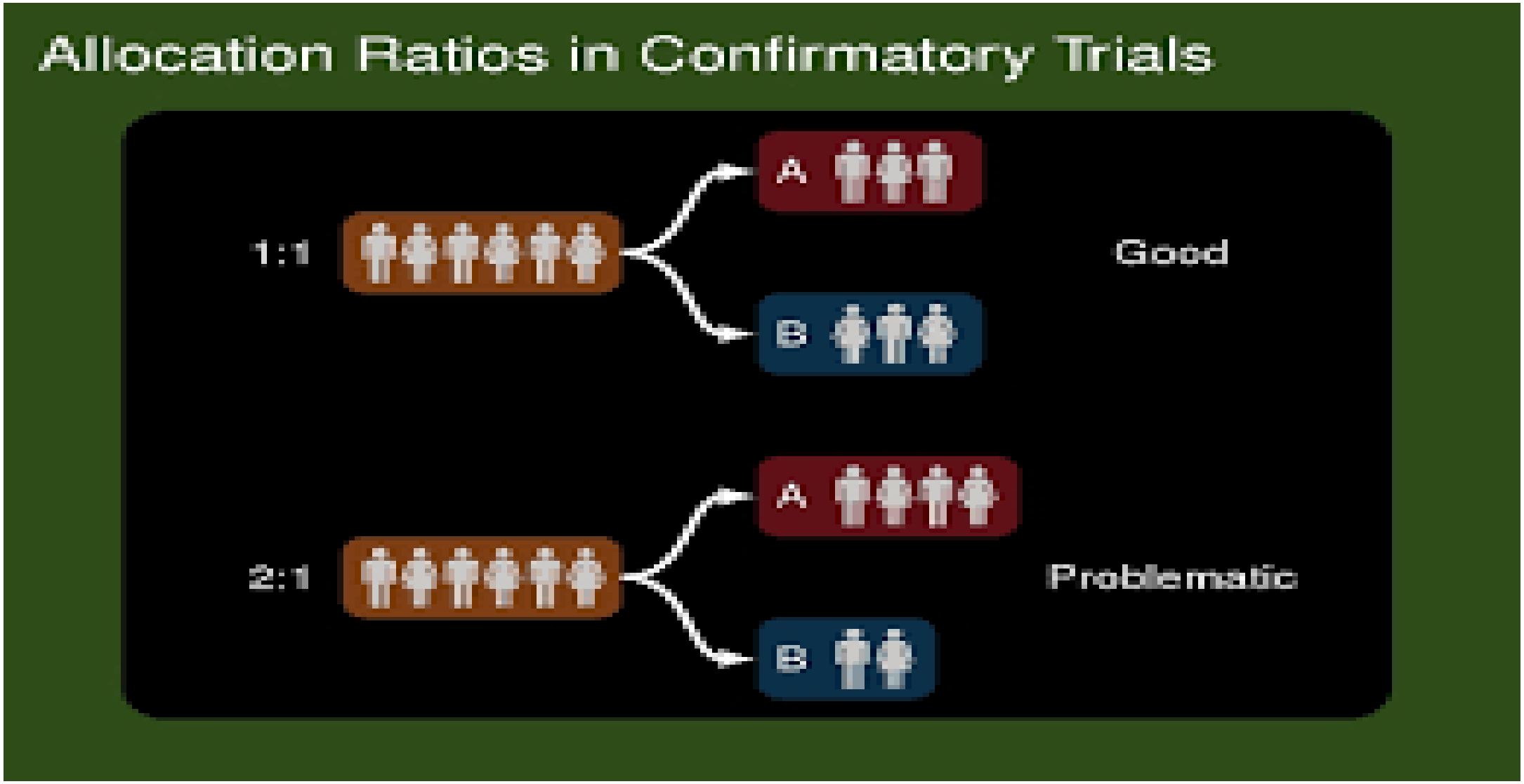
Randomization, Sampling, Allocation



Randomization, Sampling, Allocation



Randomization, Sampling, Allocation



Results		
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned received intended treatment and were analyzed for the primary outcome
	13b	For each group, losses and exclusions after randomization, together with reasons
Recruitment	14a	Dates defining the periods of recruitment and follow-up
	14b	Why the trial ended or was stopped
Baseline data	15	A table showing the baseline demographic and clinical characteristics for each group
Numbers analyzed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)

Abstract

Background: This study aimed to evaluate the non-inferiority of the FluGuard (a quadrivalent recombinant vaccine manufactured by Nivad Pharmed Salamat Company in Iran) by comparing its immunogenicity and safety with Vaxigrip Tetra (a quadrivalent inactivated vaccine manufactured by Sanofi Pasteur in France).

Materials and methods: In this double-blind, randomized controlled trial, eligible volunteers aged 18-60 were randomized to receive either FluGuard or Vaxigrip Tetra vaccines. Immunogenicity was evaluated using the Hemagglutination Inhibition (HAI) assay and reported with the geometric mean titer (GMT), seroprotection, and seroconversion. In addition, vaccine safety was assessed by interviewing participants through phone calls.

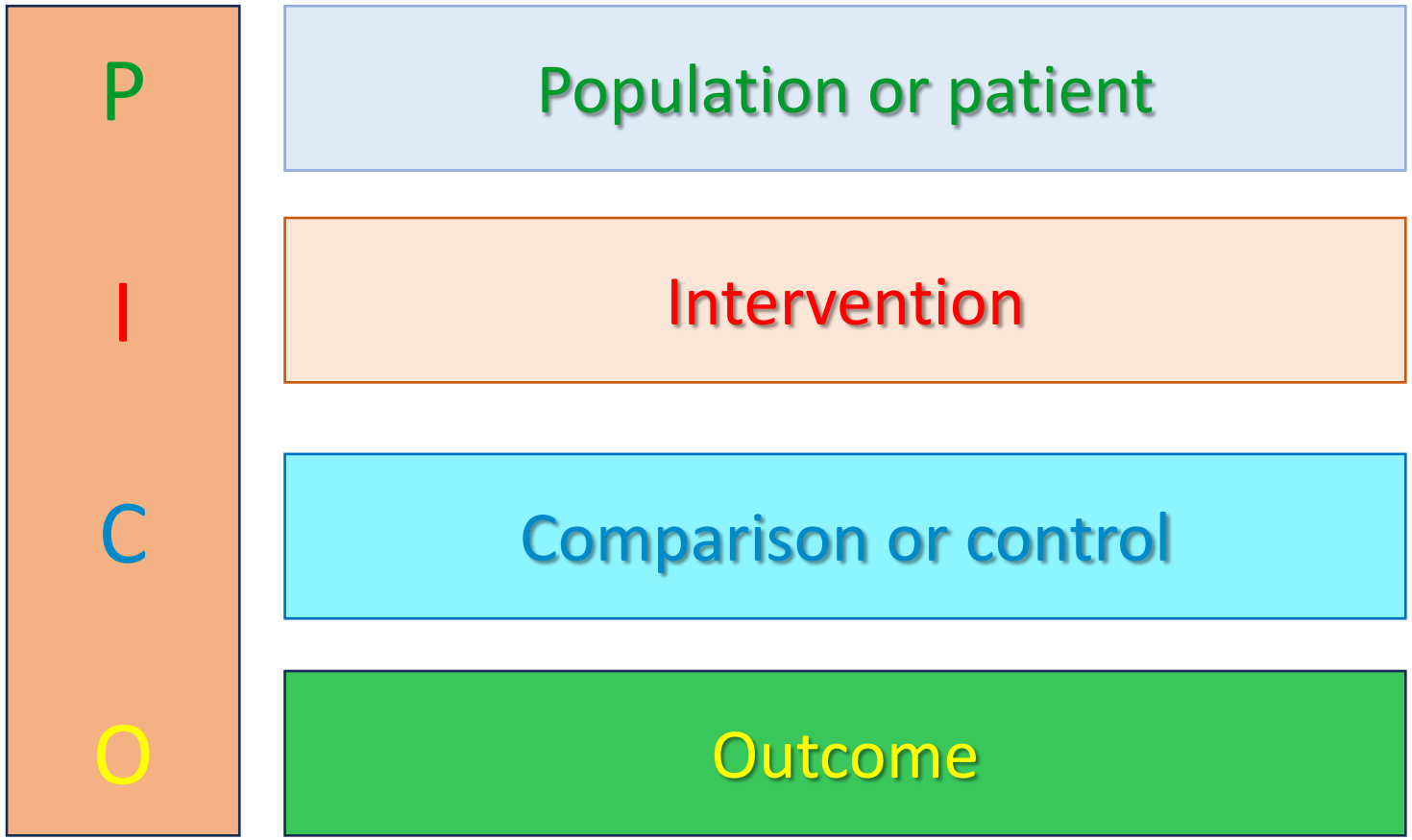
Results: Out of 110 randomized volunteers, 51 and 53 were entered into the final analysis in the Vaxigrip and FluGuard groups, respectively. Vaxigrip had a higher seroprotection rate for the H1N1 strain compared with FluGuard (98% vs. 91%). Besides, FluGuard had higher seroprotection rates for H3N2 (74% vs. 69%), B-Yamagata (87% vs. 84%), and B-Victoria (66% vs. 41%) strains compared with Vaxigrip. In all four strains, FluGuard was non-inferior to Vaxigrip with the upper bounds of the 95% CI on the ratio of the GMTs < 1.5: H1N1 (1.25), H3N2 (0.94), B-Yamagata (0.62), and B-Victoria (0.59). Furthermore, FluGuard was non-inferior to Vaxigrip with the upper bounds of the 95% CI on the difference between the seroconversion rates < 10%: H1N1 (2%), H3N2 (10%), B-Yamagata (-10%), and B-Victoria (-29%). The prevalence of solicited adverse drug reactions did not differ between groups. Furthermore, participants did not experience serious adverse events.

Conclusion: Our findings support the non-inferiority of the FluGuard vaccine to the Vaxigrip vaccine regarding immunogenicity and safety.

Keywords: Influenza vaccines, Immunogenicity, Safety, Vaxigrip, FluGuard

Title(RCT)

- PICO: Study design

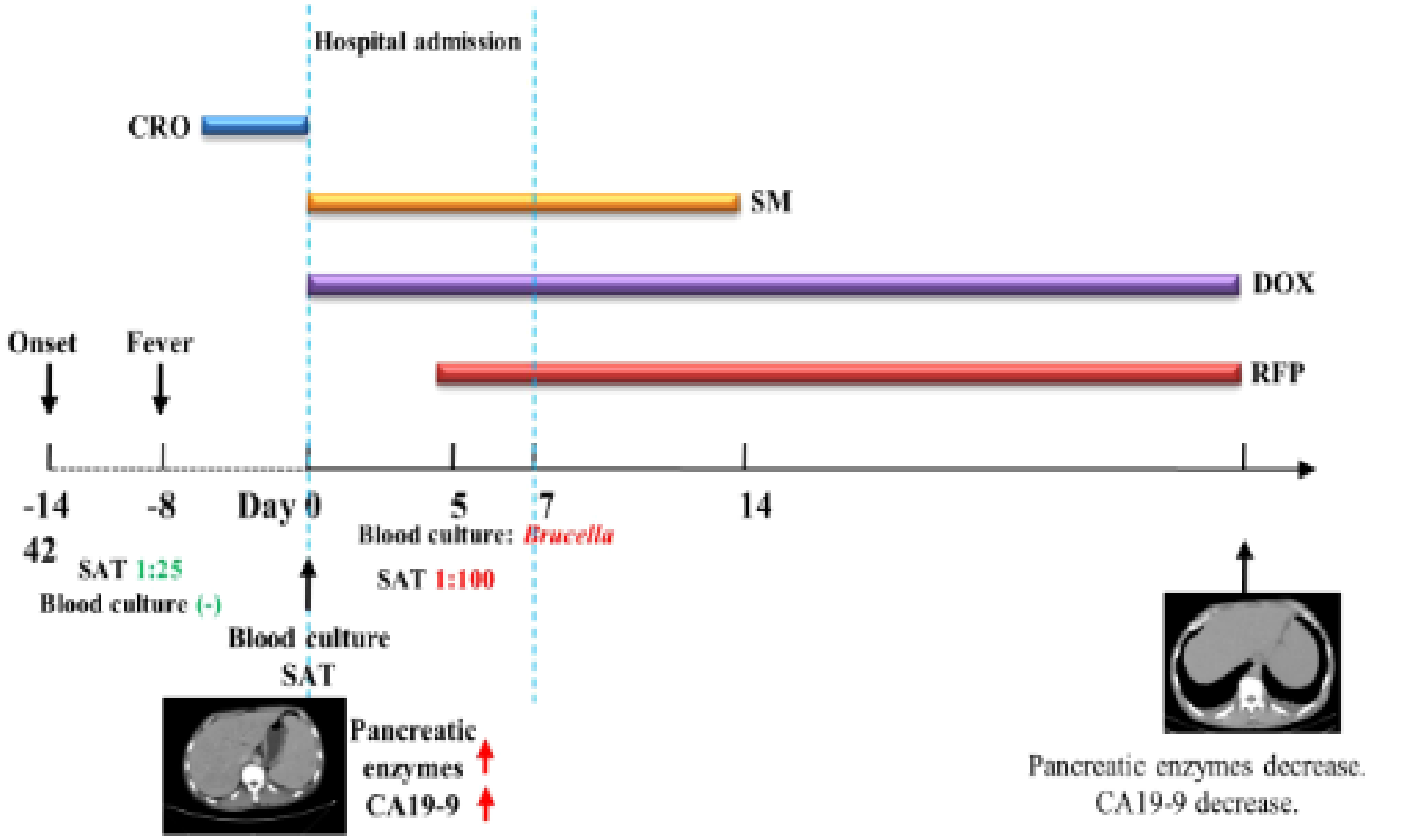


Case report

- Introduction
  - Novelty
  - Rarity
  - Life threatening condition
  - Clinical implications
- Case Presentation

Case report

- Introduction
- Case presentation
  - Timeline trend
  - Complaint
  - RF
  - PI
  - Ph/E
  - Lab tests
  - Imaging
  - F/W
  - Treatment (dosage, duration, interval, route of administration, generic drug name)



Shi L, Wang S, Li X, Li X, Li Y, Wang Y. Acute Brucella infection associated with splenic infarction: a case report and review of the literature. Frontiers in Cellular and Infection Microbiology. 2023 Oct 4;13:1234447.

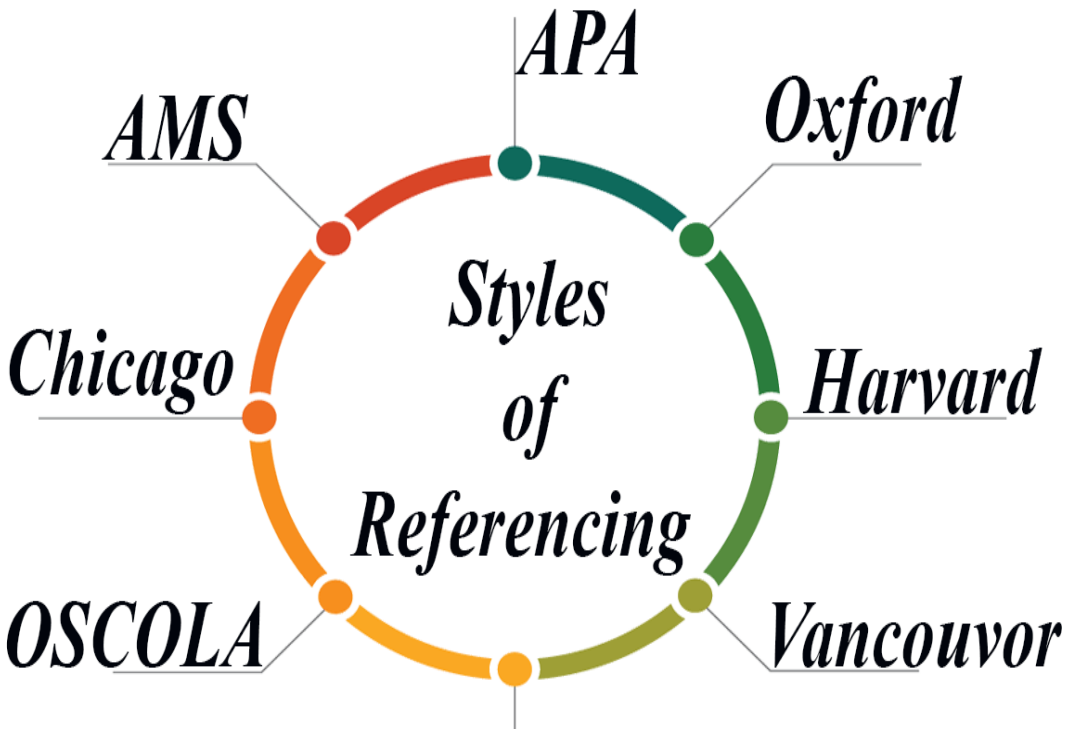
CARE
case report guidelines

CARE Checklist of information to include when writing a case report

Topic	Item	Checklist item description	Reported on Line
Title	1	The diagnosis or intervention of primary focus followed by the words "case report"	
Key Words	2	2 to 5 key words that identify diagnoses or interventions in this case report, including "case report"	
Abstract (no references)	3a	Introduction: What is unique about this case and what does it add to the scientific literature?	
	3b	Main symptoms and/or important clinical findings	
	3c	The main diagnoses, therapeutic interventions, and outcomes	
	3d	Conclusion—What is the main "take-away" lesson(s) from this case?	
Introduction	4	One or two paragraphs summarizing why this case is unique (**may include references**)	
Patient Information	5a	De-identified patient specific information.	
	5b	Primary concerns and symptoms of the patient.	
	5c	Medical, family, and psycho-social history including relevant genetic information	
	5d	Relevant past interventions with outcomes	
Clinical Findings	6	Describe significant physical examination (PE) and important clinical findings.	
Timeline	7	Historical and current information from this episode of care organized as a timeline	
Diagnostic Assessment	8a	Diagnostic testing (such as PE, laboratory testing, imaging, surveys).	
	8b	Diagnostic challenges (such as access to testing, financial, or cultural)	
	8c	Diagnosis (including other diagnoses considered)	
	8d	Prognosis (such as staging in oncology) where applicable	
Therapeutic Intervention	9a	Types of therapeutic intervention (such as pharmacologic, surgical, preventive, self-care)	
	9b	Administration of therapeutic intervention (such as dosage, strength, duration)	
	9c	Changes in therapeutic intervention (with rationale)	
Follow-up and Outcomes	10a	Clinician and patient-assessed outcomes (if available)	
	10b	Important follow-up diagnostic and other test results	
	10c	Intervention adherence and tolerability (How was this assessed?)	
	10d	Adverse and unanticipated events	
Discussion	11a	A scientific discussion of the strengths AND limitations associated with this case report	
	11b	Discussion of the relevant medical literature **with references.**	
	11c	The scientific rationale for any conclusions (including assessment of possible causes)	
	11d	The primary "take-away" lessons of this case report (without references) in a one paragraph conclusion	
Patient Perspective	12	The patient should share their perspective in one to two paragraphs on the treatment(s) they received	
Informed Consent	13	Did the patient give informed consent? Please provide if requested	Yes ☐ No ☐

References

- Based on instructions for authors



MLA Tehrani, Shabnam, et al. "Case report: pneumonia in a patient with combined variable immunodeficiency: COVID-19 or pneumocystis pneumonia?." *Frontiers in Medicine* 9 (2022): 814300.

APA Tehrani, S., Ziaie, S., Kashefizadeh, A., Fadaei, M., Najafiarab, H., & Keyvanfar, A. (2022). Case report: pneumonia in a patient with combined variable immunodeficiency: COVID-19 or pneumocystis pneumonia?. *Frontiers in Medicine*, *9*, 814300.

Chicago Tehrani, Shabnam, Shadi Ziaie, Alireza Kashefizadeh, Mahta Fadaei, Hanieh Najafiarab, and Amirreza Keyvanfar. "Case report: pneumonia in a patient with combined variable immunodeficiency: COVID-19 or pneumocystis pneumonia?." *Frontiers in Medicine* 9 (2022): 814300.

Harvard Tehrani, S., Ziaie, S., Kashefizadeh, A., Fadaei, M., Najafiarab, H. and Keyvanfar, A., 2022. Case report: pneumonia in a patient with combined variable immunodeficiency: COVID-19 or pneumocystis pneumonia?. *Frontiers in Medicine*, *9*, p.814300.

Vancouver Tehrani S, Ziaie S, Kashefizadeh A, Fadaei M, Najafiarab H, Keyvanfar A. Case report: pneumonia in a patient with combined variable immunodeficiency: COVID-19 or pneumocystis pneumonia?. Frontiers in Medicine. 2022 Feb 23;9:814300.

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Any Questions?

I Appreciate Your Attention!