Multiple choice questions in EBP

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Which one of the following studies has the highest risk of bias?

A- Case report/series

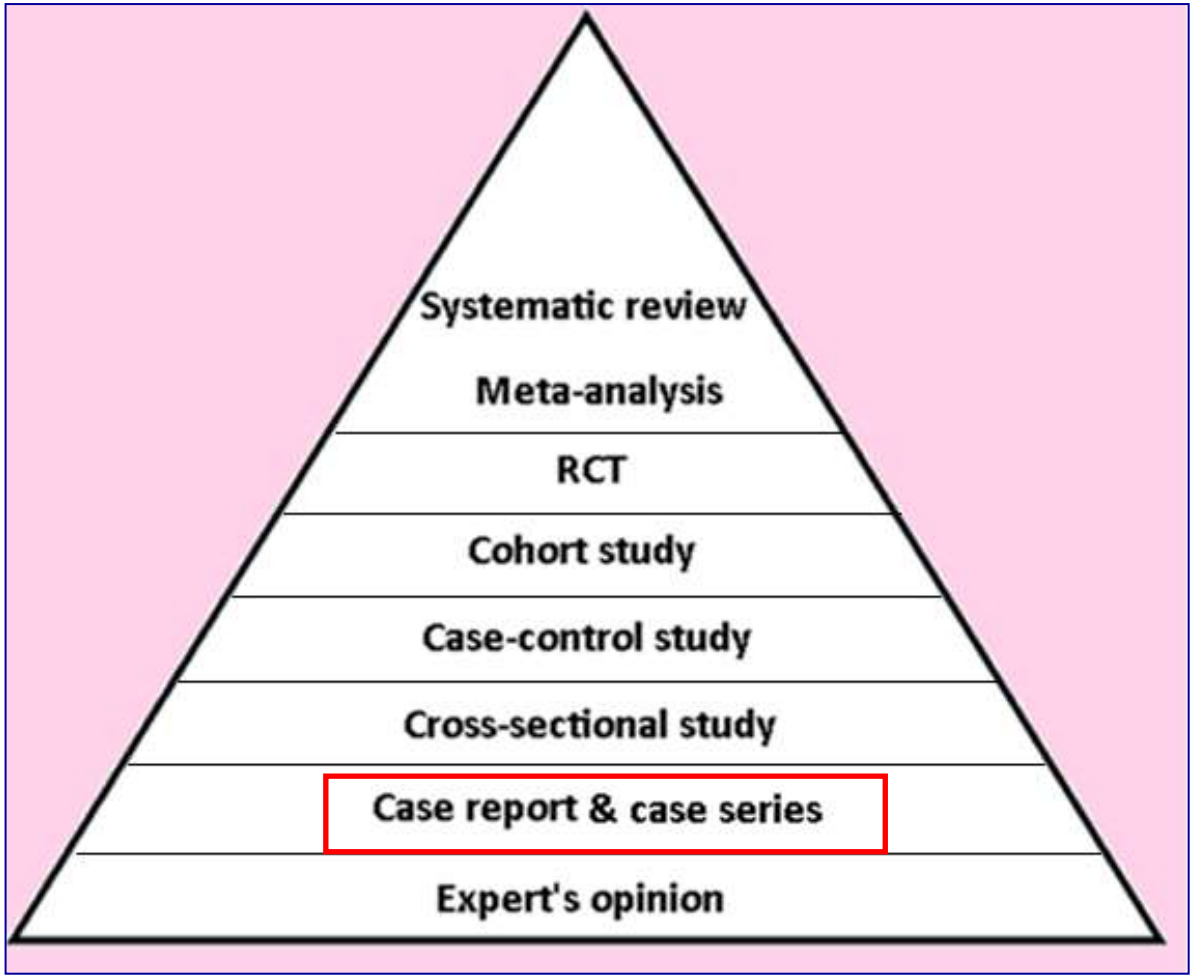
B- Cross-sectional study

C- Case- control study

D- Cohort study

E- RCT

Evidence pyramid



Increase in evidence level

Decrease in bias risk

McGovern D, Summerskill W, Valori R, Levi M. Key topics in EBM. BIOS Scientific Publishers, 1st Edition, Oxford, 2001.

What is the best design you choose to study the prevalence of a disease?

A- Ecologic study

B- Cross sectional study

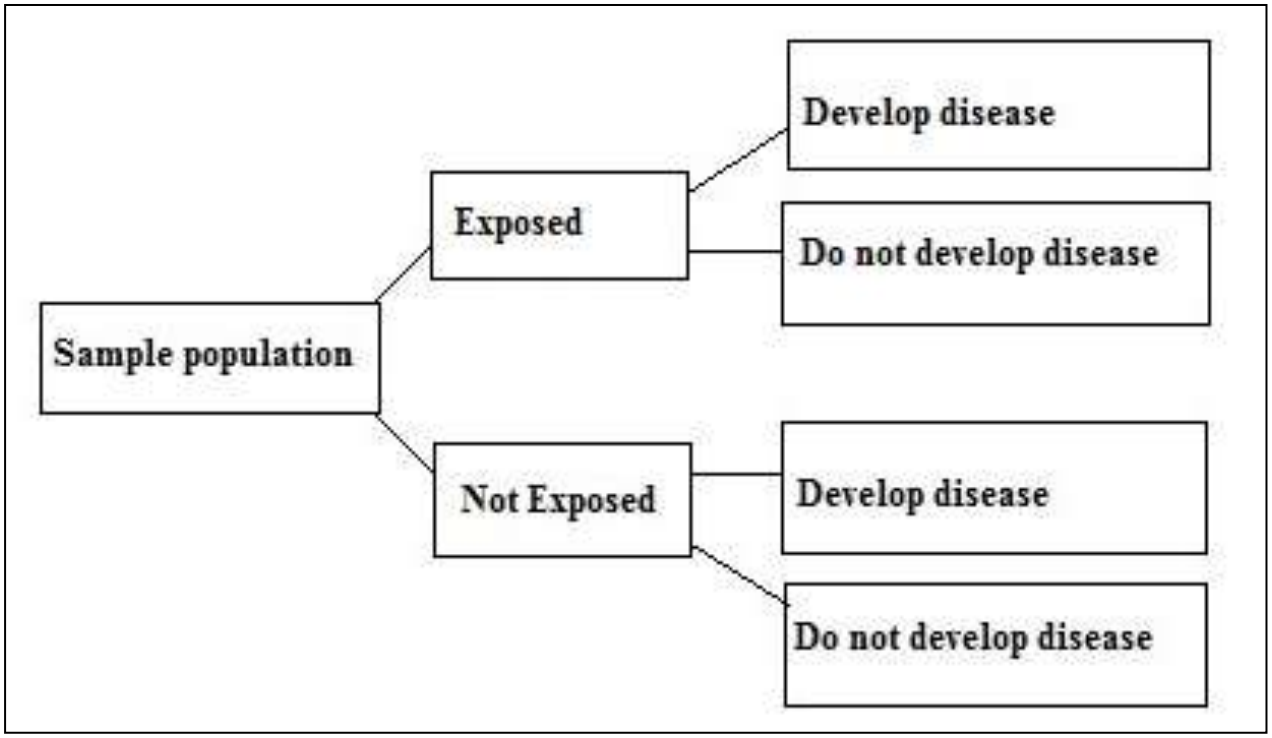
C- Case- control study

D- Cohort study

E- RCT

Cross-sectional study design

prevalence study



At one point of time

eg.: prevalence of coronary heart disease in smokers

What is the best trial design to study the incidence of a disease?

A- Ecologic study

B- Cross-sectional study

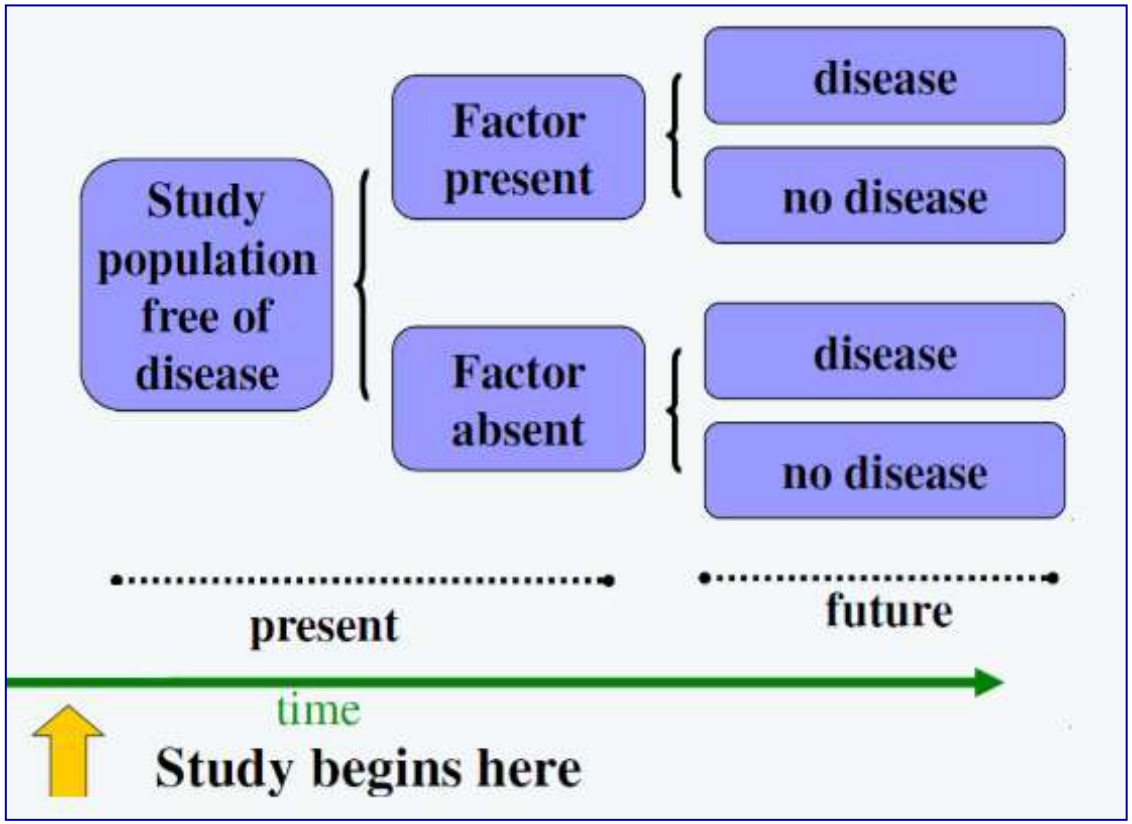
C- Case-control study

D- Cohort study

E- RCT

Cohort study

investigate etiology or outcome of disease



Prospectively over a period of time (**years or decades**)

Can be retrospective if clear point of 1st exposure

2 groups well matched to avoid **confounding factors**

Which of the following studies is considered a gold standard for analytical epidemiology?

A- Ecologic study

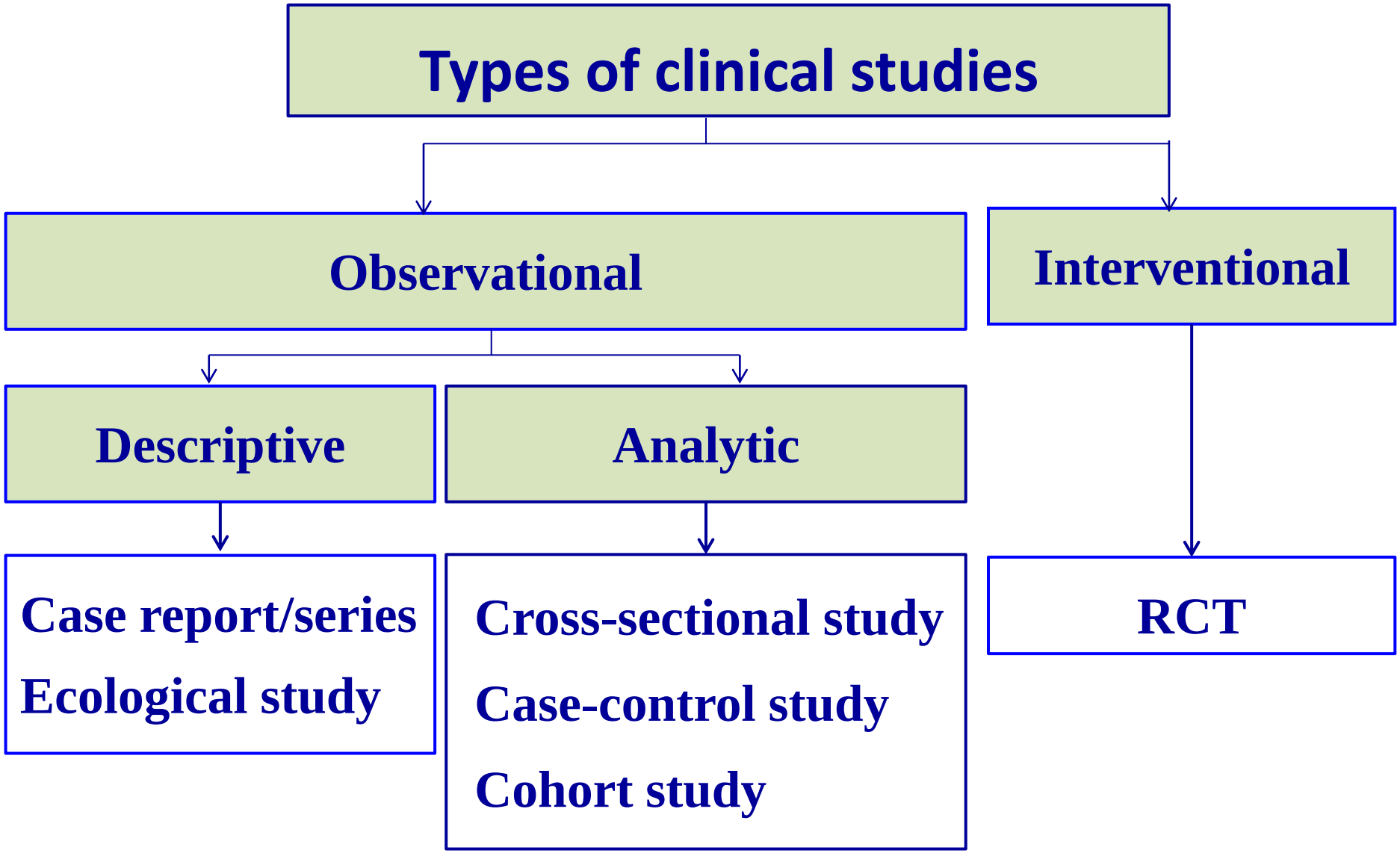
B- Cross-sectional study

C- Case-control study

D- Cohort study

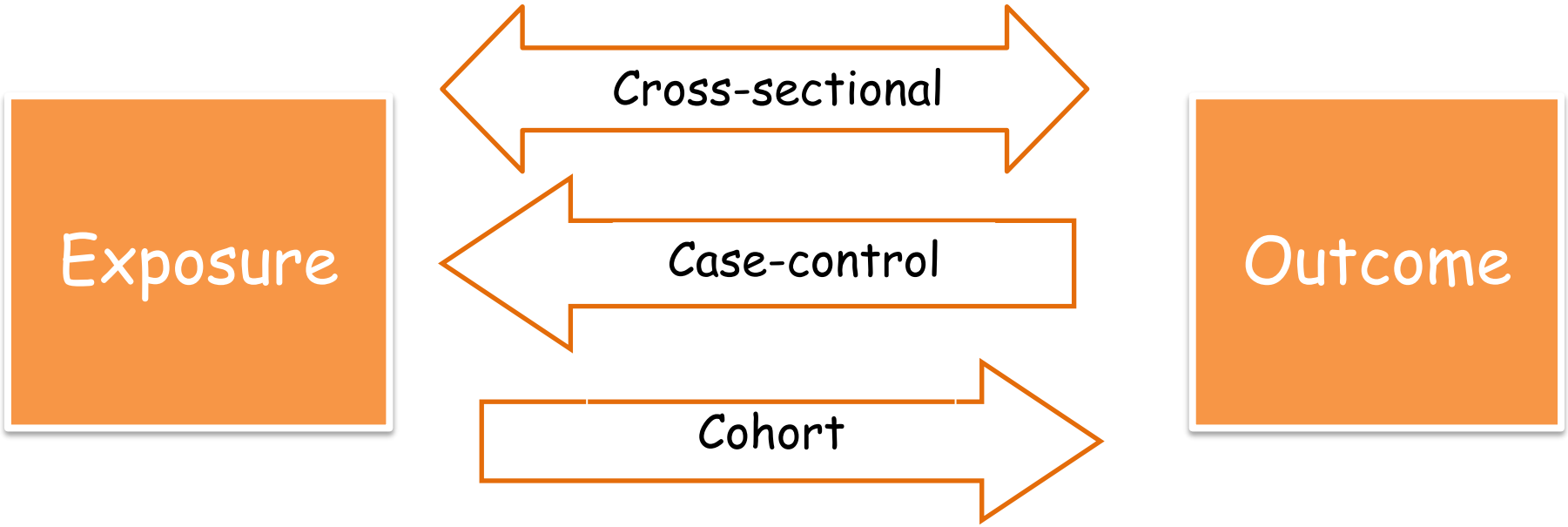
E- RCT

The cohort study is the gold-standard of analytical epidemiology



RCT: randomized controlled trial

Time is key



You want to assess the efficacy of a new anti-epileptic drug versus an old drug? What is the best design you choose for this purpose?

A- Ecologic study

B- Cross sectional study

C- Case-control study

D- Cohort study

E- RCT

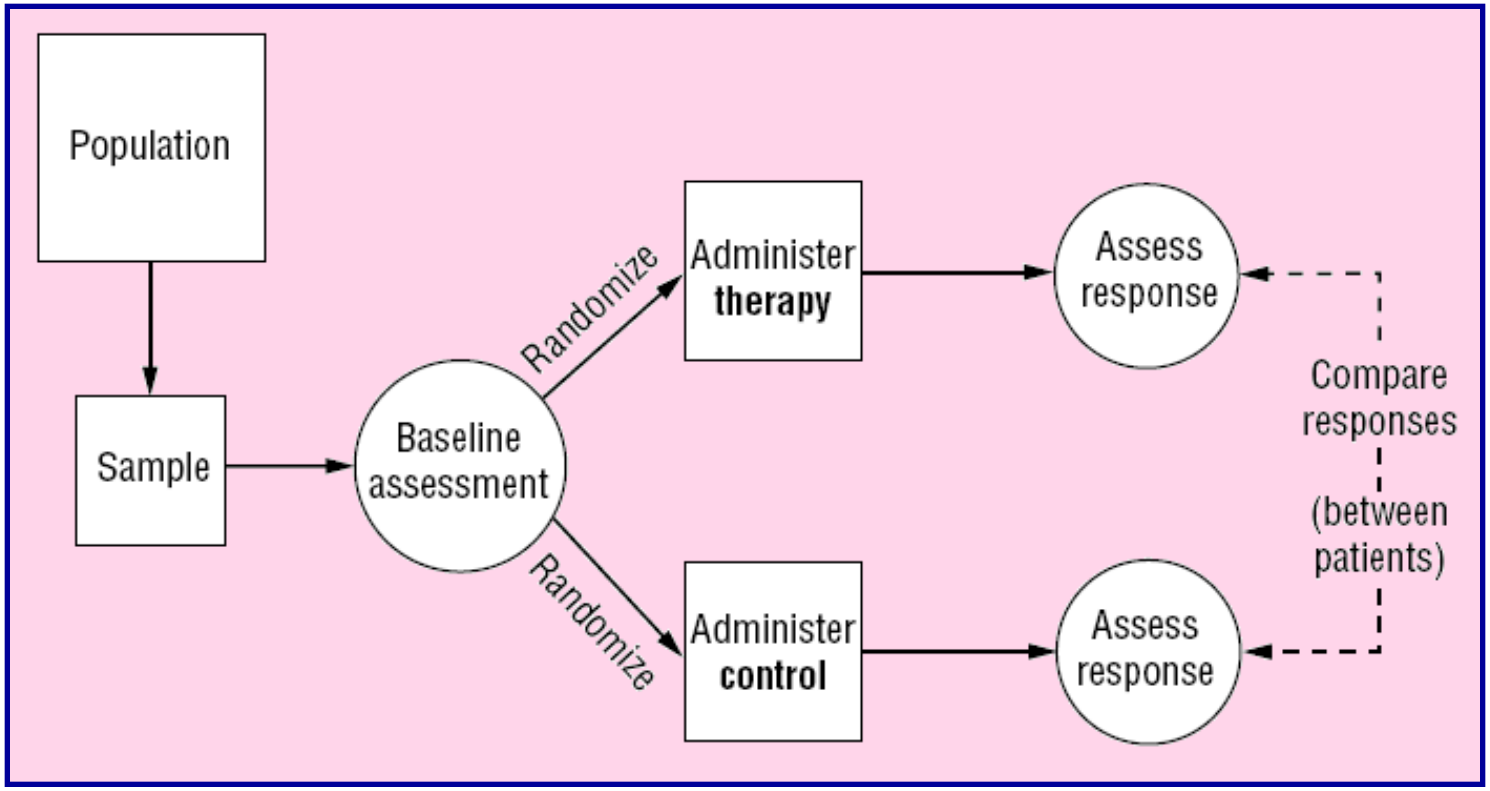
Basics of RCT – 3

RCTs are regarded as

- **Quantitative** studies (quantified outcomes)
- Most rigorous method of **hypothesis testing**
- **Experimental** studies versus observational studies
- Gold standard to evaluate **effectiveness of interventions**

Jadad AR, Enkin MW. Randomized control trials.
Blackwell Publishing, 2nd ed, 2007.

Basic structure of a RCT



Parallel trial is the most frequently used design

Akobeng AK. Arch Dis Child 2005 ; 90 : 840 – 844.

Question type & study design

Question	*Study Design*
Prevalence	*Cross-sectional study*
Diagnosis	*Cross-sectional study*
Etiology & risk factors	*Cohort or case-control*
Incidence & prognosis	*Cohort study*
Intervention	*RCT*

In each case, SR of all available studies better than individual study

You read in a paper that a p value is 0.01. Is this result clinically significant?

A- Yes

B- No

C- Cannot tell

Probability value (p value)

- **p > 0.05 Statistically insignificant**
- **p < 0.05 Statistically significant**

statistically significant → **doesn't mean** → **clinically significant**

An open label randomized controlled trial means:

A- Everyone participating in the trial is aware of assigned treatment

B- Patients are ignorant of assigned treatment

C- Investigators are ignorant of assigned treatment

D- Patients, investigators and data evaluators are ignorant of assigned treatment

Blinding or masking

Depending on blinding extent, RCTs classified as

- Open label — Everyone aware
- Single-blind — Only patients or investigators ignorant
- Double-blind — Patients & investigators ignorant
- Triple-blind — Patients, investigators & data evaluators ignorant

A critical appraisal of a RCT takes into consideration one of the followings:

A- Randomization

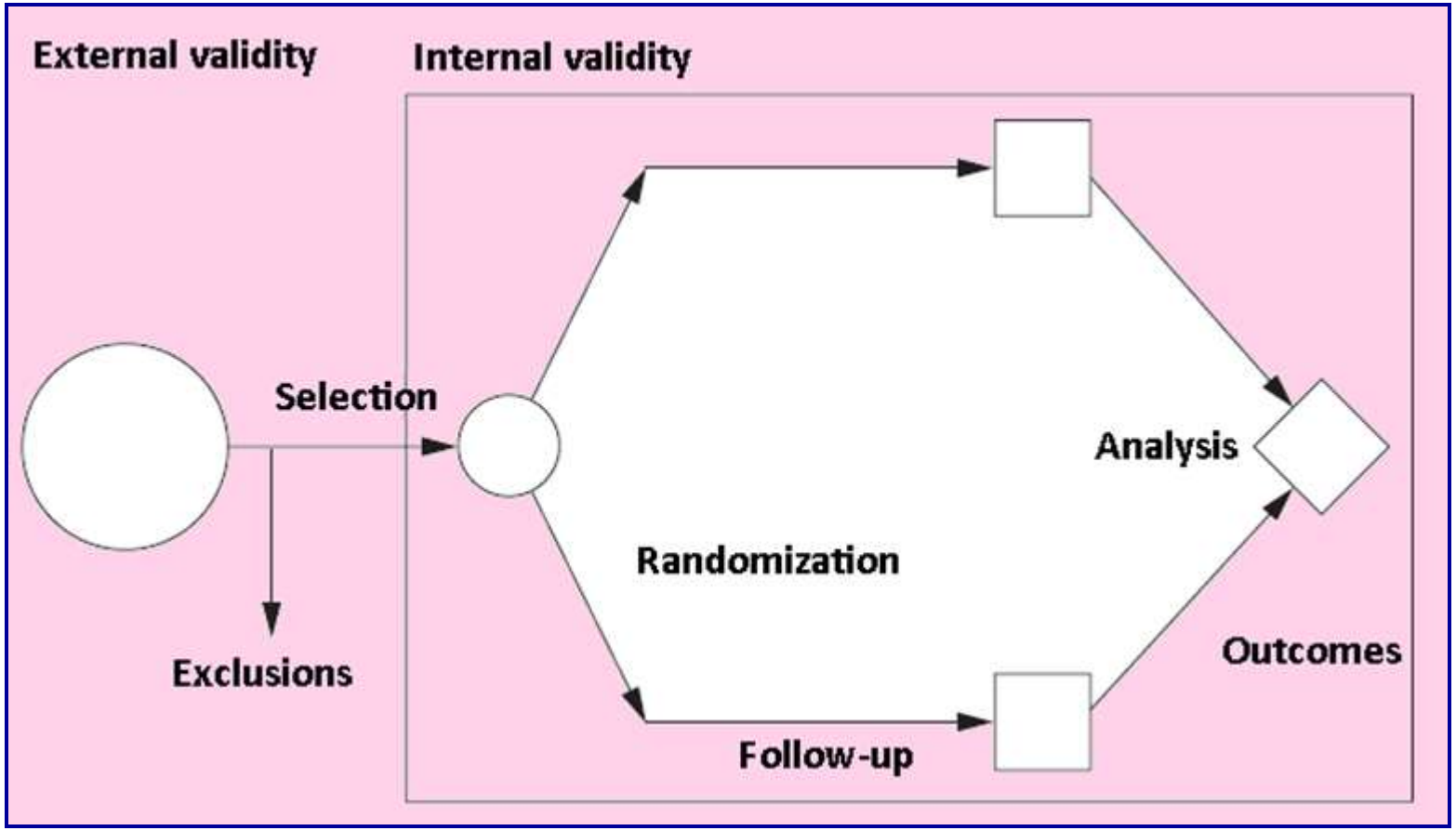
B- Blinding

C- Precision of the estimate (CI)

D- Benefice versus harm

E- All of the above

Internal & external validity of a RCT



Attia J & Page J. Evid Based Med 2001 ; 6 : 68 - 69.

Appraising a RCT (checklist) – 1

Are the results valid?	
At start of trial	❶ Were the patients **randomized**? ❷ Was the randomization **concealed**? ❸ Similar prognostic factors in 2 groups?
During trial	❹ Was trial **blinded** & to what extent?
At end of trial	❺ Was **follow-up** complete? ❻ Was **ITT** principle applied? ❼ Was the trial **stopped early**?

Guyatt G, et al. User's guide to the medical literature.
Essentials of evidence based clinical practice. Mc Graw Hill, 2nd ed, 2008.

Appraising a RCT (checklist) – 2

What are the results?

8- How **large** was the treatment effect?

9- How **precise** was estimate of treatment effect (**CI**)?

How can I apply the results to patient care?

10- Were the study patients **similar** to my patient?

11- Were all patient-**important outcomes** considered?

12- Are the likely treatment benefits worth **harm & cost**?

Guyatt G, et al. User's guide to the medical literature.
Essentials of evidence based clinical practice. Mc Graw Hill, 2nd ed, 2008.

External validity

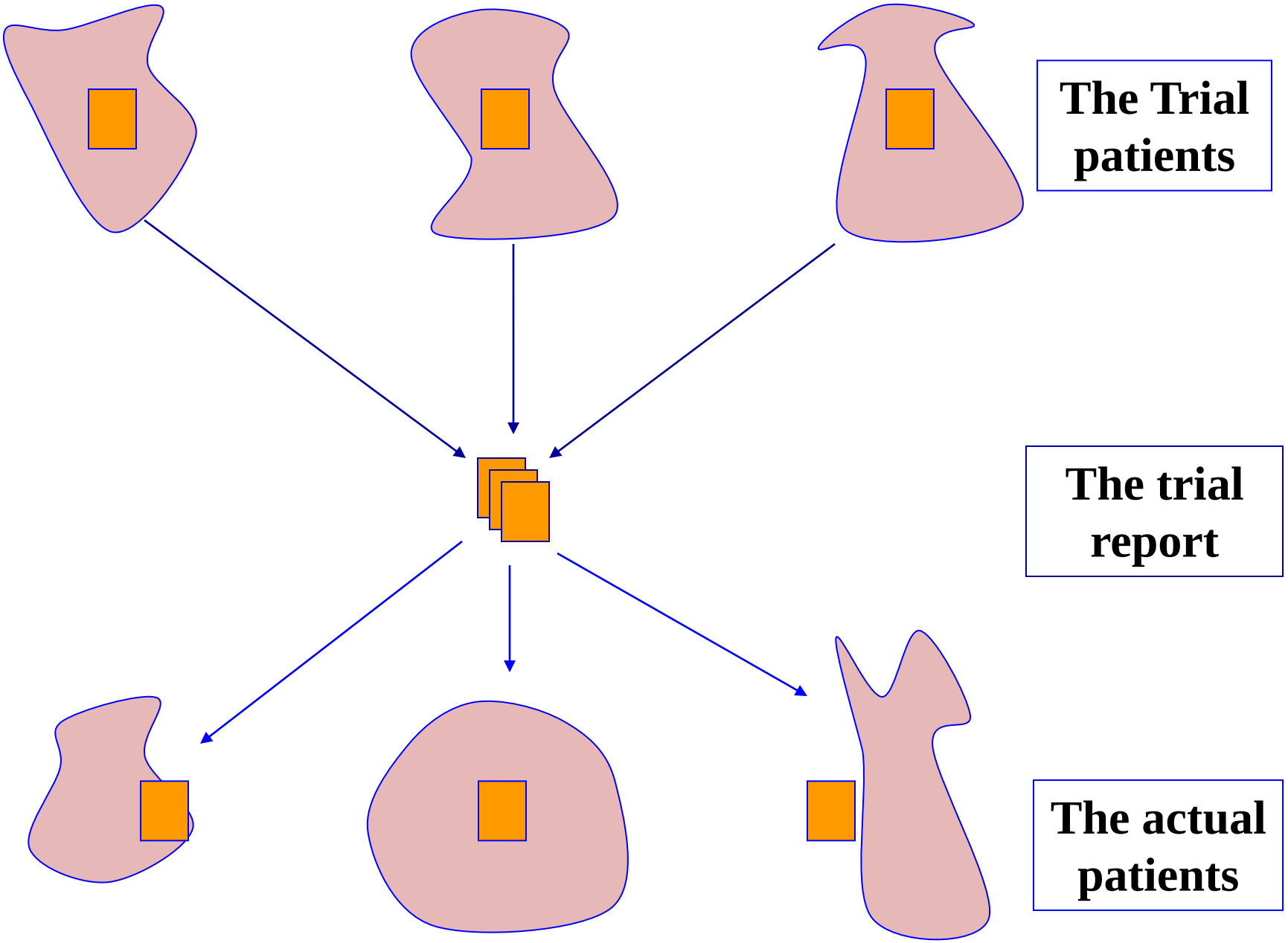
Applicability of results to your patients

Issues needed to consider before deciding to incorporate research evidence into clinical practice

- Similarity of study population to your population
- Benefit versus harm
- Patients preferences
- Availability
- Costs

* Guyatt G, et al. User's guide to the medical literature. Essentials of evidence based clinical practice. Mc Graw Hill, 2nd edition, 2008.

The problem of applying trial results



Benefit versus harm

"All that glisters is not gold"

W. Shakespeare

In "The Merchant of Venice"

Furberg BD & Furberg CD. Evaluating clinical research.
Springer Science & Business Media – 1st Edition – New York – 2007.

The receiver operating characteristic is used to report:

A- Incidence of a disease

B- Prevalence of a disease

C- Prognosis of a disease

D- Diagnostic test with 2 results (yes/no)

E- Diagnostic test with more than 2 results

Accuracy of tests & number of results

- **Dichotomous test (only 2 results)**

  Sensibility & Specificity
  PPV & NPV
  Likelihod ratio + & –
  Diagnostic OR

  } with 95% CI

- **Multilevel test (> 2 results)**

  Receiver Operating Characteristic (**ROC**)

  Make continuous test dichotomous: fixed cut-off value

Which of the followings is used to know the cut-off values of a diagnostic accuracy test (disease positive versus disease negative):

A- Positive predictive value

B- Negative predictive value

C- Likelihood ratio

D- Receiver operating characteristic

Useful properties of ROC curve

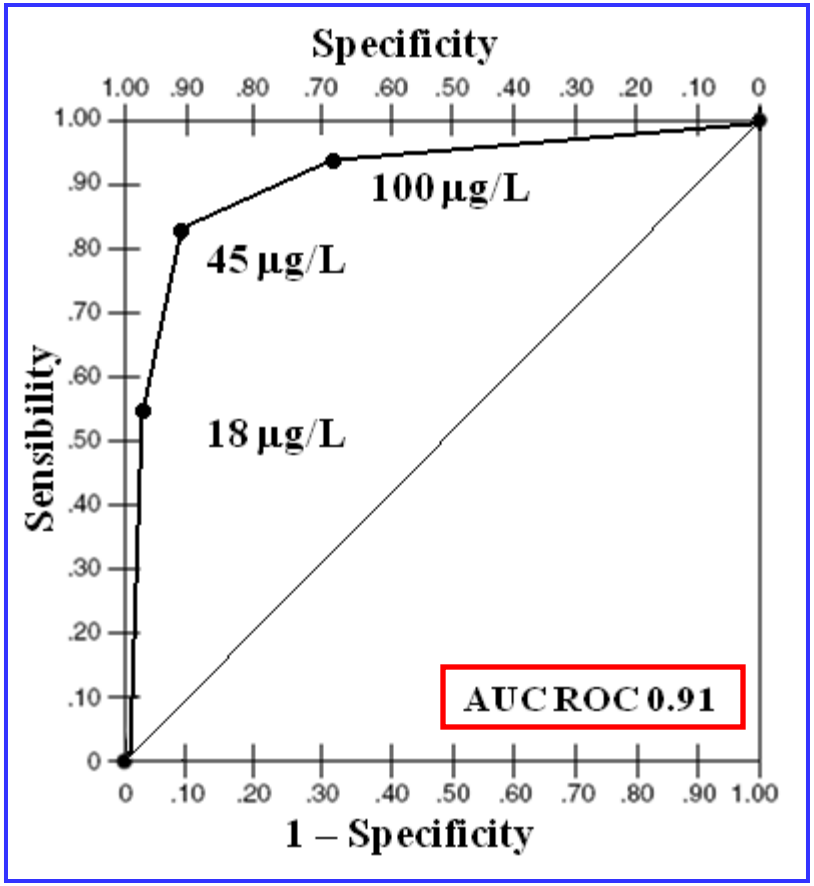
❶ AUC provides an overall measure of a test's accuracy

❷ Accuracy of binary diagnostic test for a cut-point value

❸ Determination of cut-off point to distinguish D + & D –

❹ Comparison of different tests for dg of a target disorder

❶ Area under the ROC curve in IDA



If we select 2 patients at random one with IDA & one without

Probability is 0.91 that patient with IDA will have abnormal ferritin

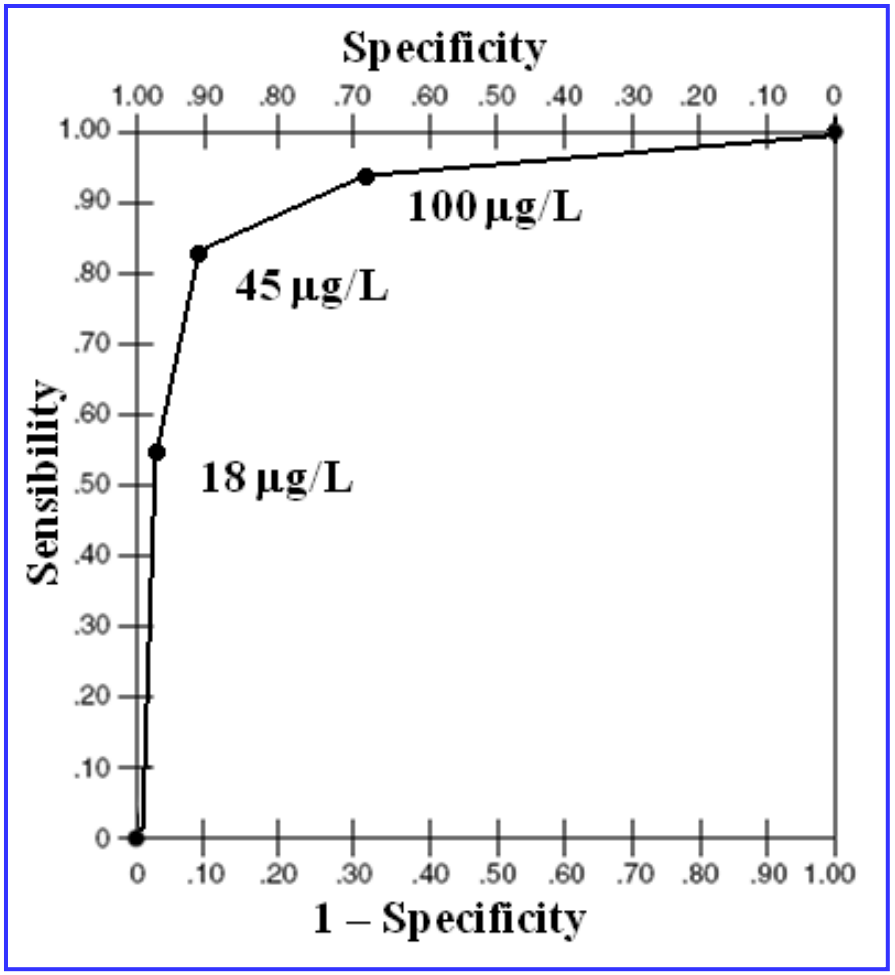
Accuracy of diagnostic test using AUC of ROC

Value	Accuracy
0.90 - 1.00	Excellent
0.80 - 0.90	Good
0.70 - 0.80	Fair
0.60 - 0.70	Poor

The higher AUC the better the overall performance of the test

Pines JM & Everett WW. Evidence-Based emergency care: diagnostic testing & clinical decision rules. Blackwell's publishing – West Sussex – UK – 2008.

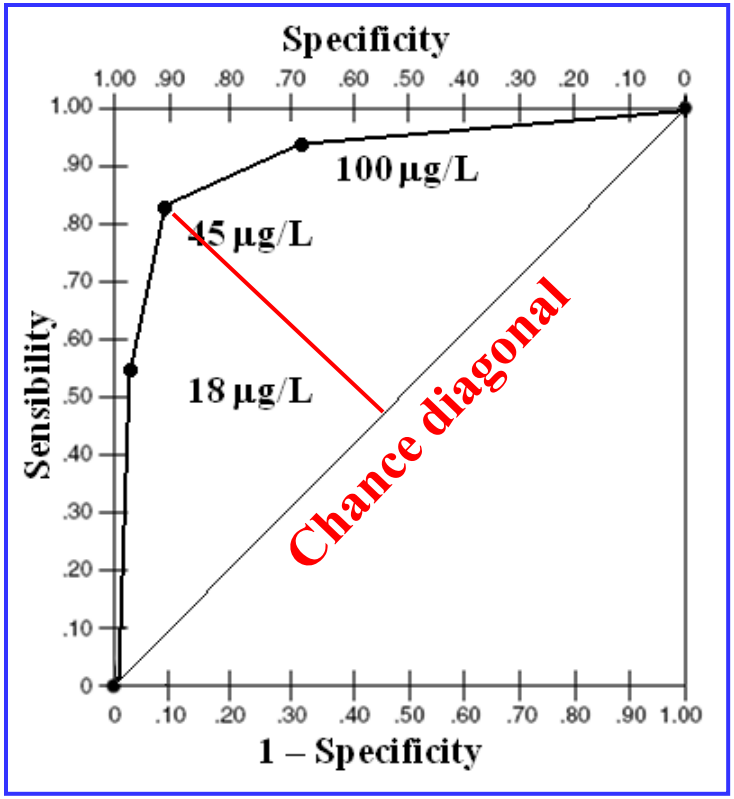
❷ Accuracy of binary dg test for a cut-point value



❸ Determination of cut-off point to distinguish D + & D –

Cut-off point discriminates between subjects with or without disease

Indicated by the point on curve that is far away from chance diagonal



Peat JK. Health science research. Allen & Unwin, Australia, 1st edition, 2001.

❹ Comparing different tests for target disorder

Diagnosis of IDA	AUC of the ROC
Seurm ferritin	0.91
Transferrin saturation	0.79
MCV	0.78
RCP	0.72

* RCP: Red Cell Protoporphyrin

Guyatt GH et al. J Gen Intern Med 1992 ; 7 : 145 – 153.

Thank You