

MODULE 1 | 2

What u need to know...

- An understanding of Risk – Absolute and Relative
- How to calculate NNT / NNH
- Sensitivity, Specificity and PPV in relation to screening
- How to interpret/calculate Odds Ratios / Hazard Ratios
- Confidence Intervals
- Statistical Significance
- Epidemiology – Studies and Terminology
- Hierarchy of Evidence
- Plots – Box / Scatter / Funnel / L’Abbe / Cates / Forrest
- Critical Appraisal Skills

Basic Statistics for the AKT

DEFINITIONS

- **Risk** – the probability that an adverse event will happen
- **Risk can be given as a % or as decimal form (e.g. 10%=0.1)**
- **Absolute Risk (AR)** = number of adverse events/total number of people
- **Absolute Risk in Control Group (ARC) also known as the Control Event Rate (CER)**
- **Absolute Risk in Treatment Group (ART) also know as the Experimental Event Rate (EER)**
- **Absolute Risk Reduction (ARR) of a treatment** = ARC - ART
- **Absolute Risk Increase (ARI) of a treatment** = ART- ARC
- **Relative Risk of an event happening in treatment group (RR or risk ratio)** = ART/ARC
- **Relative Risk Reduction (RRR) of a treatment** = 1 (100%) –RR
- **Number Needed to Treat (NNT)** = 1/ARR where ARR is given in decimal form
- **Number Needed to Harm (NNH)** = 1/ARI where ARI is given in decimal form

- **Odds Ratio (OR)** – Definition
 - used to give an estimate of relative risk from retrospective case-controlled studies **OR**
 - odds of an event happening in the experimental group, expressed as a proportion of odds of it happening in control group

IF RR (or OR) = 1,
there is no significant difference between treatment and control groups

Calculating the Odds Ratio

	Cases	Controls
Exposure to Risk Factor : +ve	a	b
-ve	c	d

	Effect	No Effect
Treatment Group	a	b
Control Group	c	d

OR = ad/bc

Screening

		Disease Present	Disease Absent
Screening	+ve	a	b
	-ve	c	d

Sensitivity : proportion of those with disease correctly identified by the test= $a/a+c$

Specificity : proportion of those without disease correctly identified by test= $d/b+d$

Positive Predictive Value :

proportion of those who test positive who have the disease = $a/a+b$

Negative Predictive Value :

Proportion of those who test negative who do not have the disease = $d/c+d$

Questions to Practice

Q1

Consider the following data from a cohort trial of cholesterol reduction in patients with ischaemic heart disease:

“...in the placebo group 10% of patients died, in the simvastatin group 8% of patients died...”

Calculate the following:

The Absolute Risk Reduction of death by being on simvastatin?

The Relative Risk of death in the simvastatin group?

The Relative Risk Reduction of death by being on simvastatin?

The NNT with simvastatin to prevent 1 death?

Q2

A trial showed that 60% of patients with shingles treated with aciclovir within 24 hours of onset had a full recovery compared with 20% treated with placebo.

What is the odds of recovery if treated with aciclovir compared with placebo?

What is the probability that patients treated with aciclovir will have a full recovery compared to those treated with placebo?

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- 1. PAUSE EACH SLIDE**
- 2. WORK OUT THE ANSWERS**
- 3. PLAY SLIDE WITH EXPLANATIONS**

Q1: A pharmaceutical representative presents you with some study data for a new drug said to reduce CV death in patients at risk. The data shows that for the period of study the control group had a CV mortality of 10% and this was reduced to 5% in the treated group. The representative points out the impressive risk reduction of 50% in the treated group.

How would this data be expressed in terms of 'numbers needed to treat' (NNT)? Select ONE option only.

- A. 2 B. 5 C. 1 D. 20 E. 50**

Q2: In this theoretical study, 1000 children were recruited at age 5 and followed up for tooth decay over a 2 year period, having been exposed to different thresholds of carbonated drinks during this period. Which is the **SINGLE CORRECT** risk ratio for tooth decay in those drinking above the threshold?

	SIGNIFICANT TOOTH DECAY	NO SIGNIFICANT TOOTH DECAY
> 5 carbonated drinks/week	75	225
< 5 carbonated drinks/week	75	525

- A 0.4**
B 2
C 0.5
D 3.2
E Relative risk is not an appropriate measure for this study type

Q3: A 55 year old lady comes to see you for advice. She is on combined HRT and has read (in the BMJ) that being on HRT for 5 years causes an increased risk of endometrial cancer of 50%. She has been on HRT for 5 years. The background risk of developing endometrial cancer in women not taking HRT is 6/1000.

Calculate the following:

- The Absolute Risk of developing endometrial cancer in women taking HRT
- The Absolute Risk Increase of developing endometrial cancer if taking HRT
- The NNH for 1 additional case of endometrial cancer if on HRT

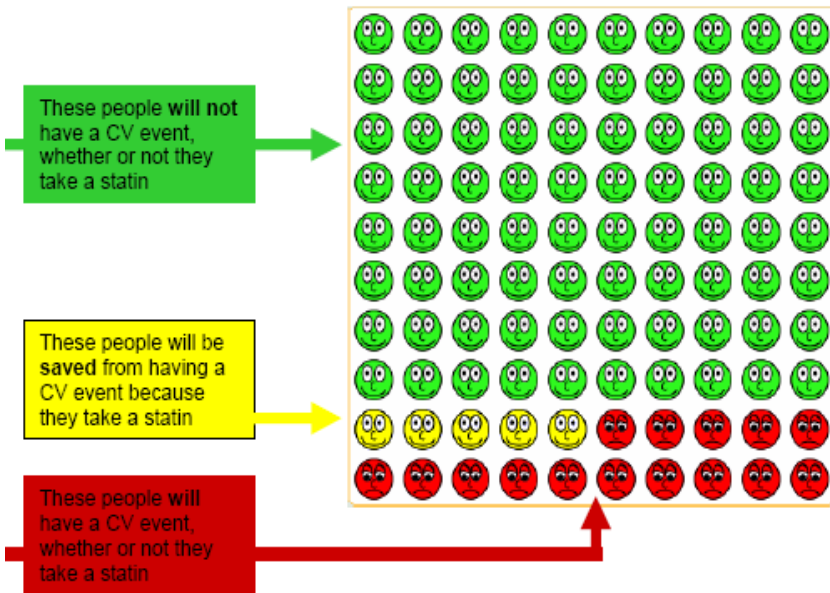
Q4: According to a large study, 'individuals who were prescribed antipsychotic drugs in the previous two years had a 32% greater risk of venous thromboembolism (VTE) than non-users'.

Which is the **SINGLE MOST** appropriate interpretation of this risk for patients who have taken regular antipsychotic medication over the past two years? Select **ONE** option only.

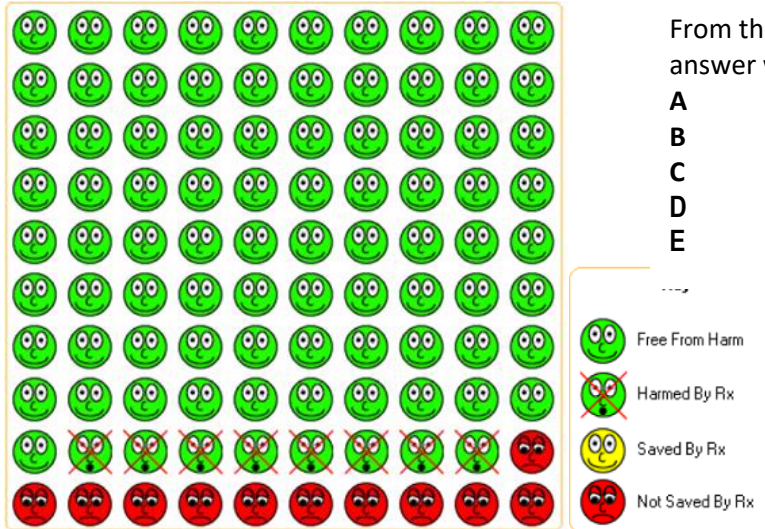
- A. 32 of every 100 patients on an antipsychotic for two years will get a VTE**
B. Patients on antipsychotics are 32 times more likely to have a VTE
C. The odds of having a VTE are approximately 1:3
D. The risk of a VTE is 1.3 times that of a patient not taking an antipsychotic
E. None of the above

Q5: The following CATES plot represents 100 people receiving simvastatin over 10 years
From the plot, calculate the following:

1. Control Event Rate
2. Experimental Event Rate
3. The Absolute Risk Reduction
4. The Relative Risk of a CV event in the simvastatin group
5. The RRR by being on simvastatin
6. The NNT to prevent 1 CV event



Q6: The following CATES plot represents 100 children who are all given antibiotics for ear infections.



From the plot, select the **SINGLE** correct answer with regards to **NNH**:

- A 8
- B 10
- C 13
- D 15
- E 18

Q7: In a population of 100 men over the age of 50 screened for prostate cancer, 10 were found to not have prostate cancer and had a negative PSA test. There were 30 false positive results. The screening test picked up 45 confirmed cases of prostate cancer with a positive PSA test.

Calculate the following:

1. How many false negative tests did the screening test pick up?
2. What is the sensitivity of the PSA test?
3. What is the specificity?
4. What is the positive predictive value of the screening test?

Q8 : Chose the appropriate statistical test.
 Fill in the boxes with **ONE** of the following **options**

<i>Samples</i>	<i>2</i>	<i>>2</i>	<i>Correlation</i>
Quantitative Parametric			
Quantitative Non-parametric			

- Options:
A Mann-Whitney-Wilcoxon
B Pearson
C Student t-test
D Friedman
E Spearman

Q9: A primary care organization requires information to estimate typical duration of hospice services required for patients with pancreatic cancer. What is the **SINGLE MOST** appropriate epidemiological measure for the situation described above?
A Case Fatality **B** Incidence **C** Median Survival **D** Mortality **E** Prevalence

Q10: According to recent evidence, injecting drug users (IDU) have a standardised mortality ratio (SMR) ten times that of the general population.
What is the SMR for the IDU group? Select ONE option only.
 Select one:
A. 90 **B.** 100 **C.** 190 **D.** 900 **E.** 1000

Q11: Please match the appropriate morbidity frequency measures with their appropriate calculations:
A Incidence risk **B** Incidence rate **C** Period Prevalence **D** Point Prevalence

1. Number of cases of disease on a particular date / Size of population on that date
2. Number of new cases of disease during specified period / Size of population at start of the period
3. Number of cases of disease during specified period / Size of population during that period
4. Number of new cases of disease during specified period / Time each person was observed totaled for all persons

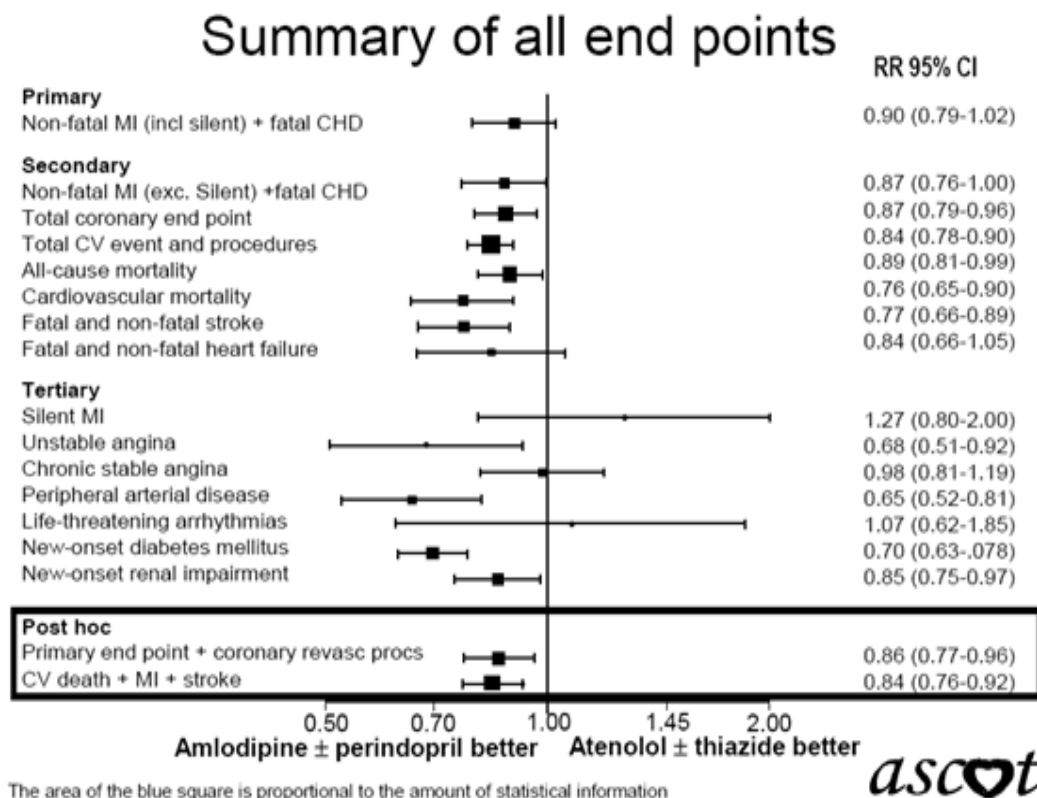
Q12: A statistical study is proposed to reach a summary conclusion regarding the results of several investigations which looked at prospective exposure to environmental tobacco smoker and risk of lung cancer.
 Which is the **SINGLE MOST** appropriate study design? Select **ONE** option only
A Case Control Study
B Cohort Study
C Correlation Study
D Descriptive Study
E Meta-analysis

Q13: With regards to the hierarchy of evidence, please match up the appropriate study to the level of evidence:

Level of evidence

- | | |
|---|--------------------------------------|
| 1 | A Mechanism based reasoning |
| 2 | B Systematic R/V of RCT |
| 3 | C Individual RCT |
| 4 | D Non randomized cohort study |
| 5 | E Case controlled study |

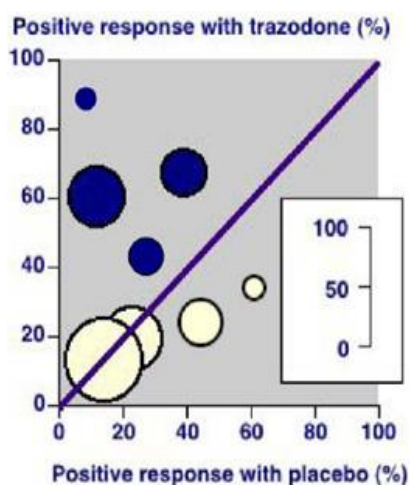
Q14: The following is a Forest Plot of the ASCOT Trial



Which **ONE** of the following statements best describes the Forest plot for the ASCOT study?

- A amlodipine & perindopril reduced the onset of diabetes on average by 30%
- B amlodipine & perindopril significantly reduced the risk of non-fatal MI
- C atenolol & thiazide was better at preventing life threatening arrhythmias
- D amlodipine & perindopril reduced the onset of renal impairment on average by 25%
- E amlodipine & perindopril had no significant effect on all cause mortality

Q15: The L'Abbe plot shows trials analyzing the effect of Trazodone for erectile dysfunction in psychogenic erectile dysfunction (dark symbols) and with physiological or mixed aetiology (light symbols).



Which **ONE** of the following statements is **INCORRECT**?

- A trazodone appears effective in the treatment of psychogenic ED
- B the size of the symbols are appropriate to the size of the trials
- C trazodone is no better than placebo in treating physiological ED
- D the trials demonstrate clinical homogeneity
- E the trials demonstrate clinical heterogeneity