



Applied Knowledge Test

KATHERINE COLE

MRCGP qualification

- ▶ E portfolio
- ▶ AKT
- ▶ CSA

Exam dates

- ▶ October
- ▶ January
- ▶ April

- ▶ Check booking dates on website
 - ▶ One week window
 - ▶ About 6 weeks before exam

- ▶ Results out on eportfolio one month later

Exam format

- ▶ Computer based at Pearson Vue test centre
- ▶ 200 questions
 - ▶ MCQ or single word answer
- ▶ Three hours ten minutes
- ▶ Pass rate ~75%
- ▶ Pass mark 68-72%

- ▶ £489
 - ▶ Part is included in subscription
 - ▶ Claim tax back

Topics

- ▶ 80% clinical medicine
- ▶ 10% critical appraisal and evidence based medicine
- ▶ 10% administration, ethics and legal issues
- ▶ “important issues relating to UK general practice; focus on higher order problem solving rather than simple recall of basic facts”

Resources

- ▶ RCGP website
 - ▶ Training
 - ▶ MRCGP exam
 - ▶ AKT
 - ▶ <http://www.rcgp.org.uk/training-exams/mrcgp-exams-overview/mrcgp-applied-knowledge-test-akt.aspx>
- ▶ AKT content guide
 - ▶ <http://www.rcgp.org.uk/training-exams/mrcgp-exams-overview/~media/D96EB4E0188E4355BCC9221B55859B08.ashx>
- ▶ GP curriculum
- ▶ Nice Clinical Knowledge Summaries / SIGN or NICE guidelines
- ▶ BNF
- ▶ AKT Summary reports

Resources

- ▶ Online question banks
- ▶ Medical statistics made easy (online book)
 - ▶ <http://sumed.sun.ac.za/Portals/0/Repository/Medical-Statistics-Made-Easy.3f8ceb88-f35b-4f29-8d70-17e78ce071d8.pdf>
- ▶ On RCGP website
 - ▶ AKT info presentation
 - ▶ Link to content guide
 - ▶ Sample questions (no explanations)
 - ▶ Online tutorial to get used to computer format
 - ▶ Info about what to take on exam day

Question types

- ▶ Single Best Answer (SBA)
- ▶ Extended Matching Questions (EMQ)
- ▶ Multiple Best Answer (MBA)
- ▶ Table/Algorithm
- ▶ Picture format
- ▶ Drag and drop
- ▶ Data interpretation
- ▶ Free text
- ▶ Rank ordering



You receive a letter from a paediatrician asking you to prescribe trimethoprim as prophylaxis for a 2-year-old boy who has had recurrent urinary tract infections. He weighs 15kg.

The BNF states the trimethoprim dose for acute infections is 4 mg/kg every 12 hours, for prophylaxis 2 mg/kg at night. A trimethoprim suspension at a concentration of 50 mg/5 ml is available.

What is the most appropriate volume of trimethoprim suspension to give at night-time to prevent urinary tract infections?

Answer: ml

Store answer



Question 3 of 10



A 22-year-old woman who has recently been diagnosed with depression presents for review. She has recently been diagnosed with epilepsy and started on carbamazepine. She has a history of depression and takes citalopram. She also has a Nexplanon fitted for contraception. Which one of the following is the most appropriate advice to give?

<input type="radio"/>	Alternative contraception needs to arranged
<input type="radio"/>	She should go for a dental check-up if she has not had one in the past 6 months
<input type="radio"/>	She should start folic acid 5mg od
<input type="radio"/>	Citalopram must be stopped
<input type="radio"/>	Carbamazepine should be taken in the evening



Question 6-8 of 10



Timed test

04:27

Theme: BNF antibiotic guidelines

- A. Doxycycline
- B. Metronidazole
- C. Ciprofloxacin
- D. Clarithromycin
- E. Phenoxymethylpenicillin
- F. Amoxicillin
- G. Co-amoxiclav
- H. Ampicillin
- I. Trimethoprim
- J. Flucloxacillin

For each one of the following conditions please select the antibiotic choice that best reflects current BNF guidelines:

6. Bacterial vaginosis

7. Human bite

8. Campylobacter

A 30-year-old woman presents with a painful 'rash' on her shins:



© Image used on license from DermNet NZ and with the kind permission of Prof Raimo Suhonen

These have been present for the past 2 weeks. There is no past medical history of note and she takes no regular medications. What is the most useful next investigation?

<input type="radio"/>	Liver function tests
<input type="radio"/>	Anti-nuclear antibody
<input type="radio"/>	ECG
<input type="radio"/>	HIV test
<input type="radio"/>	Chest x-ray

Practice Questions

- ▶ 50 sample questions on RCGP website
- ▶ RCGP 400 question CD for sale
- ▶ Online question banks
 - ▶ Passmedicine.com
- ▶ Innovait (magazine and online)

Applied Knowledge Test revision

Please select how you would like to study:

Revision mode

Knowledge tutor

Timed test

Reviews

Categories

- ☒ All categories (1103)
 - ☐ Administration and health informatics (63)
 - ☐ Dermatology (145)
 - ☐ Ear, nose and throat (22)
 - ☐ Evidence based clinical practice (60)
 - ☐ Medicine (403)
 - ☐ Cardiology
 - ☐ Endocrinology
 - ☐ Gastroenterology
 - ☐ Haematology
 - ☐ Infectious diseases
 - ☐ Metabolic medicine
 - ☐ Nephrology
 - ☐ Neurology
 - ☐ Oncology
 - ☐ Pharmacology
 - ☐ Respiratory
 - ☐ Ophthalmology (29)
 - ☐ Paediatrics (179)
 - ☐ Psychiatry (36)
 - ☐ Surgical and musculoskeletal problems (71)
 - ☐ Orthopaedics
 - ☐ Rheumatology
 - ☐ Surgery
 - ☐ Women's health (95)
 - ☐ Contraception
 - ☐ Gynaecology
 - ☐ Obstetrics

Question type ?

Show me new questions only ▾

Start test

The 29th April 15 exam is **14** days away

Questions

Your average score of **73.9%** puts you on the **87th percentile** of users who are taking the exam...[more](#)



Knowledge tutor

You've been tested on **58%** (577/997) of A++ to A facts
Acceptable recall has been achieved in **84%** of these facts...[more](#)



Some facts to review... [more](#)

An elderly women develops itchy, tense blisters around the flexures. There is no mucosal involvement - bullous pemphigoid

Coeliac disease complication - subfertility

Unexplained syncope : DVLA group 1 rules - cannot drive for 6 months

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Question 6 of 74



A 67-year-old man with recently diagnosed essential hypertension is reviewed four weeks after starting amlodipine 5mg od. He currently takes no other medication. Unfortunately he has had to stop amlodipine due to ankle swelling, which resolved after stopping the medication. What is the most appropriate next step?

<input type="radio"/>	Restart amlodipine and advise him to take it at night and elevate his legs during the day
<input type="radio"/>	Start verapamil
<input type="radio"/>	Start indapamide
<input type="radio"/>	Restart amlodipine and add furosemide 20mg od
<input type="radio"/>	Start ramipril

Submit answer

Hypertension: management

NICE published updated guidelines for the management of hypertension in 2011. Some of the key changes include:

- classifying hypertension into stages
- recommending the use of ambulatory blood pressure monitoring (ABPM) and home blood pressure monitoring (HBPM)
- calcium channel blockers are now considered superior to thiazides
- bendroflumethiazide is no longer the thiazide of choice

Blood pressure classification

This becomes relevant later in some of the management decisions that NICE advocate.

Stage	Criteria
Stage 1 hypertension	Clinic BP \geq 140/90 mmHg and subsequent ABPM daytime average or HBPM average BP \geq 135/85 mmHg
Stage 2 hypertension	Clinic BP \geq 160/100 mmHg and subsequent ABPM daytime average or HBPM average BP \geq 150/95 mmHg
Severe hypertension	Clinic systolic BP \geq 180 mmHg, or clinic diastolic BP \geq 110 mmHg

Managing hypertension

Lifestyle advice should not be forgotten and is frequently tested in exams:

- a low salt diet is recommended, aiming for less than 6g/day, ideally 3g/day. The average adult in the UK consumes around 8-12g/day of salt. A recent BMJ paper* showed that lowering salt intake can have a significant effect on blood pressure. For example, reducing salt intake by 6g/day can lower systolic blood pressure by 10mmHg
- caffeine intake should be reduced
- the other general bits of advice remain: stop smoking, drink less alcohol, eat a balanced diet rich in fruit and vegetables, exercise more, lose weight

ABPM/HBPM \geq 135/85 mmHg (i.e. stage 1 hypertension)

- treat if $<$ 80 years of age AND any of the following apply; target organ damage, established cardiovascular disease, renal disease, diabetes or a 10-year cardiovascular risk equivalent to 20% or greater

BMJ



Resistant hypertension - clinical review

[Suggest a link](#) [Report a broken link](#)

ABPM/ HBPM \geq 150/95 mmHg (i.e. stage 2 hypertension)

- offer drug treatment regardless of age

For patients < 40 years consider specialist referral to exclude secondary causes.

Step 1 treatment

- patients < 55-years-old: ACE inhibitor (A)
- patients > 55-years-old or of Afro-Caribbean origin: calcium channel blocker

Step 2 treatment

- ACE inhibitor + calcium channel blocker (A + C)

Step 3 treatment

- add a thiazide diuretic (D, i.e. A + C + D)
- NICE now advocate using either chlorthalidone (12.5-25.0 mg once daily) or indapamide (1.5 mg modified-release once daily or 2.5 mg once daily) in preference to a conventional thiazide diuretic such as bendroflumethiazide

NICE define a clinic BP \geq 140/90 mmHg after step 3 treatment with optimal or best tolerated doses as resistant hypertension. They suggest step 4 treatment or seeking expert advice

Step 4 treatment

- consider further diuretic treatment
- if potassium < 4.5 mmol/l add spironolactone 25mg od
- if potassium > 4.5 mmol/l add higher-dose thiazide-like diuretic treatment
- if further diuretic therapy is not tolerated, or is contraindicated or ineffective, consider an alpha- or beta-blocker

Patients who fail to respond to step 4 measures should be referred to a specialist. NICE recommend:

If blood pressure remains uncontrolled with the optimal or maximum tolerated doses of four drugs, seek expert advice if it has not yet been obtained.

Blood pressure targets

	Clinic BP	ABPM / HBPM
Age < 80 years	140/90 mmHg	135/85 mmHg



A 29-year-old man presents due to frequent migraine attacks. Around six months ago he was started on propranolol as migraine prophylaxis but he stopped it after two months because it was ineffective. You therefore offer him a trial of topiramate. Which one of the following side-effects is most likely to occur with this drug?

<input type="radio"/>	Tinnitus
<input type="radio"/>	Yellow discolouration of vision
<input type="radio"/>	Myalgia
<input type="radio"/>	Weight loss
<input type="radio"/>	Insomnia

Submit answer



You are considering prescribing varenicline to a 45-year-old man who is trying to stop smoking. Which one of the following conditions is most likely to contradict the prescription of varenicline?

<input type="radio"/>	Previous or current central nervous system tumour
<input checked="" type="radio"/>	Past history of deliberate self-harm
<input type="radio"/>	Hypertension
<input type="radio"/>	Epilepsy
<input type="radio"/>	Obesity

Next question

Varenicline should be used with caution in patients with a history of depression. There are ongoing studies looking at the risk of suicidal behaviour in patients taking varenicline.

Smoking cessation

NICE released guidance in 2008 on the management of smoking cessation. General points include:

- patients should be offered nicotine replacement therapy (NRT), varenicline or bupropion - NICE state that clinicians should not favour one medication over another
- NRT, varenicline or bupropion should normally be prescribed as part of a commitment to stop smoking on or before a particular date (target stop date)
- prescription of NRT, varenicline or bupropion should be sufficient to last only until 2 weeks after the target stop date. Normally, this will be after 2 weeks of NRT therapy, and 3-4 weeks for varenicline and bupropion, to allow for the different methods of administration and mode of action. Further prescriptions should be given only to people who have demonstrated that their quit attempt is continuing
- if unsuccessful using NRT, varenicline or bupropion, do not offer a repeat prescription within 6 months unless special circumstances have intervened
- do not offer NRT, varenicline or bupropion in any combination

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Question 4 of 52



A 35-year-old man with a known history of peanut allergy presents to the surgery with a swollen face. On examination blood pressure is 85/60 mmHg, pulse 120 bpm and there is a bilateral expiratory wheeze. What is the most appropriate form of adrenaline to give?

- | | |
|-----------------------|----------------------|
| <input type="radio"/> | 10ml 1:10,000 IV |
| <input type="radio"/> | 0.5ml 1:1,000 IM |
| <input type="radio"/> | 0.5ml 1:10,000 IM |
| <input type="radio"/> | 5ml 1:1,000 IM |
| <input type="radio"/> | Nebulised adrenaline |

Submit answer

Administration & ethics

- ▶ NHS organisation e.g. eligibility for treatment
- ▶ Legal aspects e.g. DVLA
- ▶ Medical certification e.g. death certificates
- ▶ Professional regulation e.g. GMC
- ▶ Business aspects e.g. GP contract
- ▶ Prescribing e.g. controlled drugs
- ▶ Appropriate use of resources e.g. drugs
- ▶ Health & Safety e.g. needlestick injury
- ▶ Social services e.g. safeguarding
- ▶ Ethical e.g. mental capacity, consent

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Question 2 of 10



You are asked to do a death certificate for an 82-year-old patient of yours. She died yesterday of pneumonia at home after her family and yourselves decided that she should not be admitted to hospital for escalation of care. She had background of dementia and osteoporosis. You last reviewed her 2 days ago.

One week ago she was discharged from hospital after having surgery for a fractured neck of femur which occurred after she tripped on a step at home. Her surgery had gone well and she had apparently made a good recovery before her chest symptoms started. What is the most appropriate action with respect to the death certificate?

<input type="radio"/>	1a: Fractured neck of femur II: Bronchopneumonia, dementia
<input type="radio"/>	1a: Hospital-acquired bronchopneumonia 1b: Fractured neck of femur, II: Dementia
<input type="radio"/>	1a: Bronchopneumonia, II: Fractured neck of femur, Dementia
<input type="radio"/>	Ask the consultant she was under to complete the death certificate
<input type="radio"/>	Speak to the coroner

Please see the Home Office link for more examples. It is recognised and encouraged to put multiple conditions on one line if this best reflects the underlying cause of the illness.

The April 2014 AKT feedback report stated: *'Two areas caused some difficulty...*

a) Death and Cremation certification. Candidates may not have much experience of completion of death and cremation certificates, but this is an important area where legal requirements must be adhered to. '

Death certification

There is no legal definition of death in the UK although guidelines exist. Current guidance states 'death should be verified by a doctor, or other suitably qualified personnel' which means staff such as nurse practitioners may verify (but not certify) death.

After a patient has died a doctor needs to complete a medical certificate of cause of death (MCCD). There is a list of circumstances in which a doctor should notify the Coroner prior to completing the MCCD.

Some specific points on completing the MCCD:

- 'old age' as 1a is only acceptable if the patient was at least 80 years of age . It can be used if certain conditions are met but is discouraged
- 'natural causes' is not acceptable
- organ failure (e.g. 'liver failure') can only be used if you specify the disease or condition that led to the organ failure (e.g. 1b: Hepatitis C)
- abbreviations should be avoided (except HIV and AIDS*)



The family then take the MCCD to the local Registrar of Births, Deaths, and Marriages office to register the death. If the Registrar decides that the death does not need reporting to the Coroner he/she will issue:

- certificate for Burial or Cremation
- certificate of Registration of Death (for Social Security purposes)
- if requested. Copies of the Death Register (banks and insurance companies expect to see them)



If the family would like the burial to be outside of England, an Out of England Order is needed from the coroner.

*why this is I'm not sure - probably due to how well known the terms are amongst the general public

External links

[Home Office](#)

Guidance for doctors completing Medical Certificates

[Ministry of Justice](#)

Cremation guidelines

[Suggest a link](#) [Report a broken link](#)



Which one of the following statements regarding the registration and recording of controlled drugs is correct?

- | | |
|-----------------------|--|
| <input type="radio"/> | The reason for administering the drug must be recorded each time a controlled drug is issued |
| <input type="radio"/> | Must be kept for a minimum of 12 months after the date of the last entry |
| <input type="radio"/> | Schedule 3 drugs must be recorded |
| <input type="radio"/> | Computerised records are acceptable |
| <input type="radio"/> | The senior partner is responsible for the receipt and supply of CDs from each doctor's bag |

Submit answer

Controlled drugs: storage and register

Storage

In the surgery controlled drugs (CDs) should be stored in a locked cabinet.

Controlled drugs outside of the surgery must be stored in a locked receptacle (combination lock or key). A doctor's bag with a lock is acceptable. It should be noted that storing a controlled drug in a locked car boot is not acceptable.

Register

A register must be kept for the supply of Schedule 2 drugs.

Specific requirements of the register:

- must be bound rather than loose leaved. Computerised records are acceptable as long as they are secure and auditable
- each drug should have its own individual section
- entries should be chronological and made in indelible ink
- the following information should be recorded when receiving CDs: date, name and address of the supplier, quantity received, name, form and strength
- the following information should be recorded when supplying CDs (either to patients or practitioners): date, name and address of the person receiving the CD, person who prescribed or ordered the CD, quantity supplied, name, form and strength
- must be kept for a minimum of 2 years after the date of the last entry

For doctor's bags a separate CD register should be kept for the CD stock held within that bag. The individual doctor is responsible for the receipt and supply of CDs from their own bag.

Search Passmedicine

External links

[Suggest a link](#)



Question 4 of 61



You are a GP registrar. A patient presents with spreading, irregular pigmented lesion on her leg. On examination it looks almost certainly to be a malignant melanoma. You tell the patient that you are concerned it may be a serious form of skin cancer. The patient replies that she doesn't believe in 'western medicine' and wants to use 'traditional remedies' such as homeopathy. How should you respond to this situation?

- | | |
|-----------------------|--|
| <input type="radio"/> | Call her daughter to discuss the matter |
| <input type="radio"/> | Refer her anyway given the severity of the diagnosis, it is her decision whether she attends or not |
| <input type="radio"/> | Accept her decision and take no further action |
| <input type="radio"/> | Explain that you will always respect her decision but ask her to come and see you in one week |
| <input type="radio"/> | Explain to the patient that given her decision you are obliged to seek psychiatric review under GMC guidelines |

[Submit answer](#)



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Next question

This scenario looks at autonomy in a competent adult. Whilst her decision may seem illogical to you this is not grounds for presuming a lack of mental capacity. The best course of action is to respect her decision but arrange follow-up after she has had time to think.

As mentioned previously an illogical decision is not grounds for presumption of mental incapacity. A psychiatric review is therefore inappropriate and is likely to alienate the patient.

Calling her daughter breaks confidentiality and is the worst option.

A 62-year-old man is seen in the rapid access transient ischaemic attack clinic following three episodes over the past two weeks of transient left sided weakness. What is the most appropriate advice to give with regards to driving?

- | | |
|-----------------------|--|
| <input type="radio"/> | Cannot drive for 12 months |
| <input type="radio"/> | Cannot drive until investigations complete |
| <input type="radio"/> | Inform DVLA but can continue driving |
| <input type="radio"/> | Cannot drive for 3 months |
| <input type="radio"/> | Cannot drive for 1 month |

Submit answer

DVLA: neurological disorders

The guidelines below relate to car/motorcycle use unless specifically stated. For obvious reasons, the rules relating to drivers of heavy goods vehicles tend to be much stricter

Specific rules

- first seizure: 6 months off driving*. For patients with established epilepsy they must be fit free for 12 months before being able to drive
- stroke or TIA: 1 month off driving
- multiple TIAs over short period of times: 3 months off driving
- craniotomy e.g. For meningioma: 1 year off driving**
- pituitary tumour: craniotomy: 6 months; trans-sphenoidal surgery 'can drive when there is no debarring residual impairment likely to affect safe driving'
- narcolepsy/cataplexy: cease driving on diagnosis, can restart once 'satisfactory control of symptoms'
- chronic neurological disorders e.g. multiple sclerosis, motor neuron disease: DVLA should be informed, complete PK1 form (application for driving licence holders state of health)

Syncope

- simple faint: no restriction
- single episode, explained and treated: 4 weeks off
- single episode, unexplained: 6 months off
- two or more episodes: 12 months off

*previously rule was 12 months. It is now 6 months off driving if the licence holder has undergone assessment by an appropriate specialist and no relevant abnormality has been identified on investigation, for example EEG and brain scan where indicated

**if the tumour is a benign meningioma and there is no seizure history, licence can be reconsidered 6 months after surgery if remains seizure free



Which one of the following is a valid reason for exception reporting a patient under the quality and outcomes framework (QOF)?

- | | |
|-----------------------|---|
| <input type="radio"/> | A patient who has spent more than 3 months in the past 12 months in hospital |
| <input type="radio"/> | A child who is being treat for acute lymphoblastic leukaemia who has coexistent asthma |
| <input type="radio"/> | A patient who is on the maximum tolerated doses of medication whose treatment remains sub-optimal |
| <input type="radio"/> | A patient with localised prostate cancer who has hypertension |
| <input type="radio"/> | A patient who is caring for a relative who is terminally ill |

Submit answer

Quality and Outcomes Framework

The Quality and Outcomes Framework (QOF) is the annual reward and incentive programme detailing GP practice achievement results. It was introduced as part of the new General Medical Services (GMS) to incentivise not only the management of chronic disease such as diabetes but also to improve the organisation of the practice and patient experience

Other points

- for clinical indicators the value of a point is determined by the prevalence of that condition in the practice
- participation in the QOF is voluntary
- 5% of practices should be visited at random to help prevent fraud.

The table below shows the four key areas on which the QOF is based

Domain	Notes
Clinical indicators	Standards linked to the care of patients suffering from chronic diseases. The largest domain of QOF
Public health	Smoking cessation, cervical screening, child health surveillance etc. Includes what were previously termed 'additional services'. The second largest domain of QOF
Quality and productivity	Auditing referral patterns and taking action to reduce admissions
Patient experience	Based on patient surveys and length of consultations

Patients may be 'exception reported' in the following situations:

- patients who have been recorded as refusing to attend review who have been invited on at least three occasions during the preceding 12 months
- patients for whom it is not appropriate to review the chronic disease parameters due to particular circumstances e.g. Terminal illness, extreme frailty

Search

Suggest a

Statistics

- ▶ Understanding the principles of audit and its application in assessing the quality of care
- ▶ Understanding the application of critical appraisal skills which will be tested in a number of formats including:
 - ▶ the interpretation of research data using results in published papers
 - ▶ the understanding of terms used in both statistics and evidence based medicine
 - ▶ understanding epidemiology relevant to general practice



A researcher wants to see if a persons age and blood pressure have a linear relationship. He begins by drawing a scatter plot of the data. Which of the following would he use next?

<input type="radio"/>	ANOVA
<input type="radio"/>	Mann Whitney U test
<input type="radio"/>	Pearson's coefficient
<input type="radio"/>	Chi squared
<input type="radio"/>	T-test

Submit answer

Correlation and linear regression

External links

[Suggest a link](#)

The terms correlation and regression are related but are not synonymous. Correlation is used to test for association between variables (e.g. whether salary and IQ are related). Once correlation between two variables has been shown regression can be used to predict values of other dependent variables from independent variables. Regression is not used unless two variables have firstly been shown to correlate.

Correlation

The degree of correlation is summarised by the correlation coefficient (r). This indicates how closely the points lie to a line drawn through the plotted data. In parametric data this is called Pearson's correlation coefficient and can take any value between -1 to +1.

For example

- $r = 1$ - strong positive correlation (e.g. systolic blood pressure always increases with age)
- $r = 0$ - no correlation (e.g. there is no correlation between systolic blood pressure and age)
- $r = -1$ - strong negative correlation (e.g. systolic blood pressure always decreases with age)

Whilst correlation coefficients give information about how one variable may increase or decrease as another variable increases they do not give information about how much the variable will change. They also do not provide information on cause and effect.

Correlation is summarised when using parametric variables by Pearson's correlation coefficient (represented by a small r). In the situation of non parametric variables, Spearman's correlation coefficient is used. Spearman's correlation coefficient is usually represented by the Greek letter ρ (rho), or by r_s .

In the case of dichotomous variables logistic regression is used. Linear (or simple linear) regression is used when looking for association between two continuous variables, and multiple regression is used when looking for association between more than two continuous variables.

Linear regression



Which one of the following statements regarding significance tests is correct?

<input type="radio"/>	The chance of making a type I error is not affected by sample size
<input type="radio"/>	The probability of making a type II error is termed alpha
<input type="radio"/>	Type I errors are false negatives
<input type="radio"/>	A p value of 0.1 or less is usually deemed significant
<input type="radio"/>	A type III error is defined as a study which has insufficient power

Submit answer

Significance tests

A null hypothesis (H_0) states that two treatments are equally effective (and is hence negatively phrased). A significance test uses the sample data to assess how likely the null hypothesis is to be correct.

For example:

- 'there is no difference in the prevalence of colorectal cancer in patients taking low-dose aspirin compared to those who are not'

The alternative hypothesis (H_1) is the opposite of the null hypothesis, i.e. There is a difference between the two treatments

The **p value** is the probability of obtaining a result by chance at least as extreme as the one that was actually observed, assuming that the null hypothesis is true. It is therefore equal to the chance of making a type I error (see below).

Two types of errors may occur when testing the null hypothesis

- type I: the null hypothesis is rejected when it is true - i.e. Showing a difference between two groups when it doesn't exist, a false positive. This is determined against a preset significance level (termed alpha). As the significance level is determined in advance the chance of making a type I error is not affected by sample size. It is however increased if the number of end-points are increased. For example if a study has 20 end-points it is likely one of these will be reached, just by chance.
- type II: the null hypothesis is accepted when it is false - i.e. Failing to spot a difference when one really exists, a false negative. The probability of making a type II error is termed beta. It is determined by both sample size and alpha

	Study accepts H_0	Study rejects H_0
Reality H_0		Type 1 error (alpha)
Reality H_1	Type 2 error (beta)	Power (1 - beta)

The power of a study is the probability of (correctly) rejecting the null hypothesis when it is false, i.e. the probability of detecting a statistically significant difference

Search

Suggest



A study is designed to assess a new proton pump inhibitor (PPI) in elderly patients who are taking aspirin. The new PPI is given to 120 patients whilst a control group of 240 is given the standard PPI. Over a five year period 24 of the group receiving the new PPI had an upper GI bleed compared to 60 who received the standard PPI. What is the absolute risk reduction?

<input type="radio"/>	15%
<input type="radio"/>	10%
<input type="radio"/>	12
<input type="radio"/>	5%
<input type="radio"/>	20

Submit answer

Absolute risk reduction = (Experimental event rate) - (Control event rate)

Control event rate = $60 / 240 = 0.25$

Experimental event rate = $24 / 120 = 0.2$

Absolute risk reduction = $0.25 - 0.2 = 0.05 = 5\%$ reduction

Numbers needed to treat and absolute risk reduction

Numbers needed to treat (NNT) is a measure that indicates how many patients would require an intervention to reduce the expected number of outcomes by one

It is calculated by $1/(\text{Absolute risk reduction})$ and is rounded to the next highest whole number

Experimental event rate (EER) = (Number who had particular outcome with the intervention) / (Total number who had the intervention)

Control event rate (CER) = (Number who had particular outcome with the control / (Total number who had the control)

Absolute risk reduction = CER-EER or EER-CER?

The absolute risk reduction (ARR) may be calculated by finding the absolute difference between the control event rate (CER) and the experimental event rate (EER). You will often find both versions of the above listed in different sources. In some ways it doesn't matter which you use as you will end up with the same answer but from a technical point of view:

- if the outcome of the study is undesirable then $ARR = CER - EER$
- if the outcome of the study is desirable then $ARR^* = EER - CER$

*this may be more accurately termed absolute benefit increase, rather than absolute risk reduction

Search Page

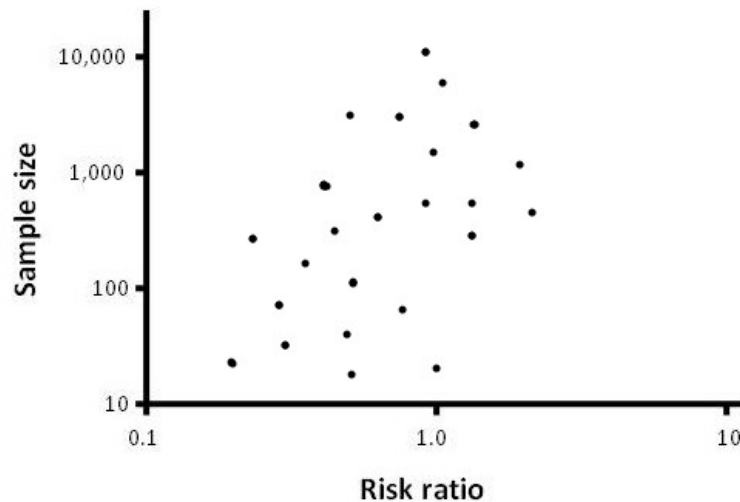
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A meta-analysis is performed looking at trials that investigate whether taking low-dose aspirin reduces the incidence of breast cancer. A lower risk ratio implies a lower risk of developing breast cancer whilst taking aspirin. The results of the trials are summarised below:



What is the most appropriate interpretation of this diagram?

- ☐ There is no publication bias
- ☐ There is publication bias by larger studies which fail to find a protective effect from taking aspirin
- ☐ There is publication bias by larger studies which demonstrate a protective effect from taking aspirin
- ☐ There is publication bias by smaller studies which fail to find a protective effect from taking aspirin
- ☐ There is publication bias by smaller studies which demonstrate a protective effect from taking aspirin

<input type="radio"/>	There is publication bias by larger studies which demonstrate a protective effect from taking aspirin
<input checked="" type="radio"/>	There is publication bias by smaller studies which fail to find a protective effect from taking aspirin
<input type="radio"/>	There is publication bias by smaller studies which demonstrate a protective effect from taking aspirin

Next question

This funnel plot clearly shows a gap in the bottom right hand aspect of the diagram. This suggests a publication bias by studies which do not report a protective effect from taking aspirin, i.e. Small studies that didn't find a benefit with aspirin did not publish their results.

Funnel plot

A funnel plot is primarily used to demonstrate the existence of publication bias in meta-analyses. Funnel plots are usually drawn with treatment effects on the horizontal axis and study size on the vertical axis.

Interpretation

- a symmetrical, inverted funnel shape indicates that publication bias is unlikely
- conversely, an asymmetrical funnel indicates a relationship between treatment effect and study size. This indicates either publication bias or a systematic difference between smaller and larger studies ('small study effects')

Tips

- ▶ Topic based revision
- ▶ Stats and admin
- ▶ Lots of practice questions
- ▶ Any questions?