Requirements at Examination Methods

Examination Methods

There are several investigative methods to search for patients within the population:

1. **Individual detection** - testing every person who sought medical attention for any reason.
2. **Preventive examinations**
3. **Screening** - searching patients at risk or persons in the early or subclinical stage of disease in the population who are apparently healthy people.

The cost of screening test should also be considered. his not only includes the cost for running screening tests, but also expenses for those how test positively.

- **Simple screening tests** - questionnaires, X-rays, blood tests, ECG etc.
- **Multiple screening** - set of tests to search multiple diseases simultaneously.

To evaluate the quality of the diagnosis, we can arrange the data in a table:

Test	Disease +	Healthy-	Total
+	a	b	a+b
-	c	d	c+d
Total	a+c	b+d	n

Sensitivity

This is the probability of a positive test result from patients with disease **a/a+c**. Sensitivity of a test gives values from 0 to 1 (0-100%) and tells us how the test captures the presence of the reference condition in the body.

$$\text{sensitivity} = \frac{\text{number of true positives}}{\text{number of true positives} + \text{number of false negatives}}$$

$$= \text{probability of a positive test given that the patient is ill}$$

For example, if he had a mammography screening test for breast cancer with 100% sensitivity, it would mean that **all** women who had breast cancer, the tumour was **actually detected**. We have a group of 4 women - Lucy, Jane, Cathie and Lenka. Lucy has breast cancer. All women undergo the screening mammography. It detects Lucy and Jane as positive. Lucy is really positive. Jane is a false positive. Cathie and Lenka are actually negative. Nobody is falsely negative. When you enter the values into the formula above, we find that the test showed 100% sensitivity.

Specificity

Specificity is the probability of a negative result in healthy patients **b/b+d**. The specificity of a test reflects on the ability of a test to identify true negatives.

$$\text{specificity} = \frac{\text{number of true negatives}}{\text{number of true negatives} + \text{number of false positives}}$$

$$= \text{probability of a negative test given that the patient is well}$$

For example, if he had a mammography screening for breast cancer with 100% specificity, it would mean that **all** women without breast cancer that underwent screening tested negative. We have a group of 4 women - Lucy, Jane, Cathie and Lenka. has breast cancer. Lucy has breast cancer. All women undergo the screening mammography. It detects Lucy and Jane as positive. Lucy is really positive. Jane is a false positive. Cathie and Lenka are actually negative. Nobody is falsely negative. When you enter the values into the formula above, we find that the test showed about 67% specificity (specificity = 0.67). One woman with no tumor was identified as positive (we have one woman falsely positive).

False Positive

Probability of a positive result in healthy individuals **b/b+d**

False Negative

Probability of a negative result in ill individuals **c/a+c**

Positive Predictive Value

Probability that patient is actually ill when the test result was positive **a/a+b**

Negative Predictive Value

Probability that patient is actually healthy when the test result was negative **d/c+d**

Diagnostic Accuracy

Probability of the test providing accurate (true) test results **a+d/n**

Useful Mnemonic

SPIN and SNOUT are commonly used mnemonics which says:

A highly SPecific test, when Positive, rules IN disease (SP-P-IN), and a highly 'SeNsitive' test, when Negative rules OUT disease (SN-N-OUT)

Links

Bibliography

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