

SCREENING – HIGH-YIELD SUMMARY

Iceberg Phenomenon of Disease

- Tip of the iceberg: clinically apparent cases (what physicians see).
 - Submerged portion: hidden disease burden:
 - Subclinical cases
 - Undiagnosed cases
 - Carriers
 - Screening targets the hidden mass in the community.
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Definition of Screening

Screening is:

“The search for unrecognized disease or defect by means of rapidly applied tests, examinations, or other procedures in apparently healthy individuals.”

Screening vs Diagnostic Tests

Diagnostic Test	Screening Test
Applied to sick individuals	Applied to apparently healthy people
Applied to individual patients	Applied to groups
More accurate	Less accurate
More expensive	Less expensive
Basis of treatment	Not a basis of treatment
Initiated by patient	Initiated by health services

Aim of Screening

To sort out from a large group of apparently healthy people those:

- Likely to have disease
- Or at increased risk

and bring them under medical supervision and treatment.

Related Terms

- Screening: Testing people not seeking health care
- Example: HIV testing in blood donors
- Case finding: Testing people seeking care for other reasons
- Example: VDRL in pregnant women
- Diagnostic tests: Confirm disease in symptomatic patients

Types of Screening

1. Mass screening
 - Whole population or large groups
 - Example: cervical cancer screening
 2. Targeted (high-risk) screening
 - High-risk groups only
 - Example: diabetes screening in those with family history
 3. Multiphasic screening
 - Two or more tests at the same time
 - Example: blood + urine tests
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Criteria for Screening

A. Criteria of the Disease

- Important public health problem
 - Natural history well understood
 - Detectable early stage
 - Effective treatment available
 - Early treatment more beneficial
 - Facilities for diagnosis available
 - Benefits outweigh risks
 - Cost-effective
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B. Criteria of the Screening Test

1 Acceptability

- Simple
- Safe
- Rapid
- Non-invasive
- Non-painful
- Cheap
- Accepted by population

2 Repeatability (Reliability)

التكرار (الموثوقية)

- Gives consistent results on repetition
- Depends on:
 - Observer variation
 - Biological variation
 - Technical variation

3 Validity

- Ability to correctly identify disease status
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Validity Measures

Sensitivity

- Ability to identify true cases
- Formula:

$$\text{Sensitivity} = \text{TP} / (\text{TP} + \text{FN})$$

Specificity

- Ability to identify true non-cases
- Formula:

$$\text{Specificity} = \text{TN} / (\text{TN} + \text{FP})$$

Cut-Off Point

- Value above which test is abnormal
 - Choice of cut-off affects:
 - True positives
 - True negatives
 - False positives
 - False negatives
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Which Is More Important in Screening?

- High sensitivity preferred when:
 - Disease is serious/lethal
 - Early detection improves prognosis

(e.g., breast, cervical cancer)

- High specificity preferred when:
 - Disease is common
 - Treatment does not change outcome much

(e.g., diabetes)

- To avoid excess false positives

Predictive Values

Positive Predictive Value (PPV)

- Probability that a positive test is truly diseased
- Formula:

$$PPV = TP / (TP + FP)$$

Negative Predictive Value (NPV)

- Probability that a negative test is truly non-diseased
- Formula:

$$NPV = TN / (TN + FN)$$

📌 Predictive values depend on disease prevalence.

Accuracy

- Proportion of all correct results
- Formula:

$$Accuracy = (TP + TN) / (TP + TN + FP + FN)$$

Drawbacks of Screening

- Anxiety and stress from false positives
- Unnecessary investigations and treatment
- Prolonged awareness of untreatable disease
- False reassurance from false negatives
- Waste of medical resources
- Unnecessary uncomfortable procedures

Golden Exam Points ★

- Screening ≠ diagnosis
- Targets apparently healthy people
- Sensitivity ↑ → false negatives ↓
- Specificity ↑ → false positives ↓
- PPV & NPV depend on prevalence