Medical Screening and Surveillance

- **The fundamental purpose of screening is early diagnosis and treatment of the individual and thus has a clinical focus.**

- **The fundamental purpose of surveillance is to detect and eliminate the underlying causes such as hazards or exposures of any discovered trends and thus has a prevention focus.**

What is Screening

1. Screening is the testing of apparently healthy populations to identify previously undiagnosed diseases or people at high risk of developing a disease.
2. Screening aims to detect early disease before it becomes symptomatic.
3. Screening is an important aspect of prevention, but not all diseases are suitable for screening.
4. Screening interventions are not designed to be diagnostic.

Principles of screening

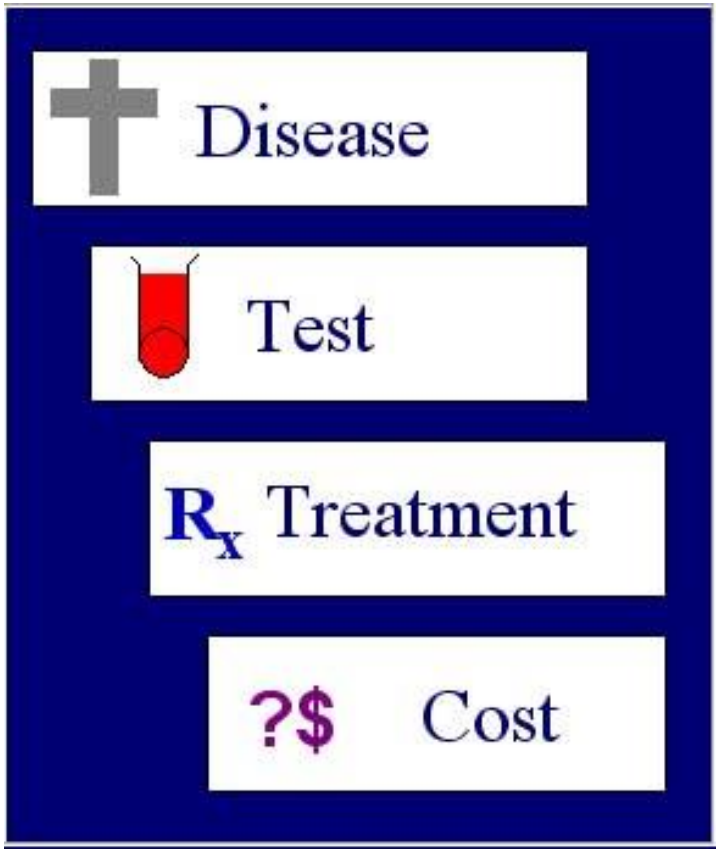
- WHO guidelines were published in 1968, but are still applicable

1. The condition should be an important health problem.
2. There should be a treatment for the condition.
3. Facilities for diagnosis and treatment should be available.
4. There should be a latent stage of the disease.
5. There should be a test or examination for the condition.
6. The test should be acceptable to the population.
7. The natural history of the disease should be adequately understood.
8. There should be an agreed policy on whom to treat.
9. The total cost of finding a case should be economically balanced in relation to medical expenditure as a whole.
10. Case-finding should be a continuous process, not just a "once and for all" project.

Common screening programmes

1. Cancer screening
   a. Pap smear or liquid-based cytology to detect potentially precancerous lesions and prevent cervical cancer
   b. Mammography to detect breast cancer
   c. Colonoscopy to detect colorectal cancer
   d. Fecal occult blood test screening for bowel cancer
2. PPD test to screen for exposure to tuberculosis
3. Beck Depression Inventory to screen for depression
4. Alpha-fetoprotein, blood tests and ultrasound scans for pregnant women to detect fetal abnormalities
5. Screening of for Metabolic Syndrome

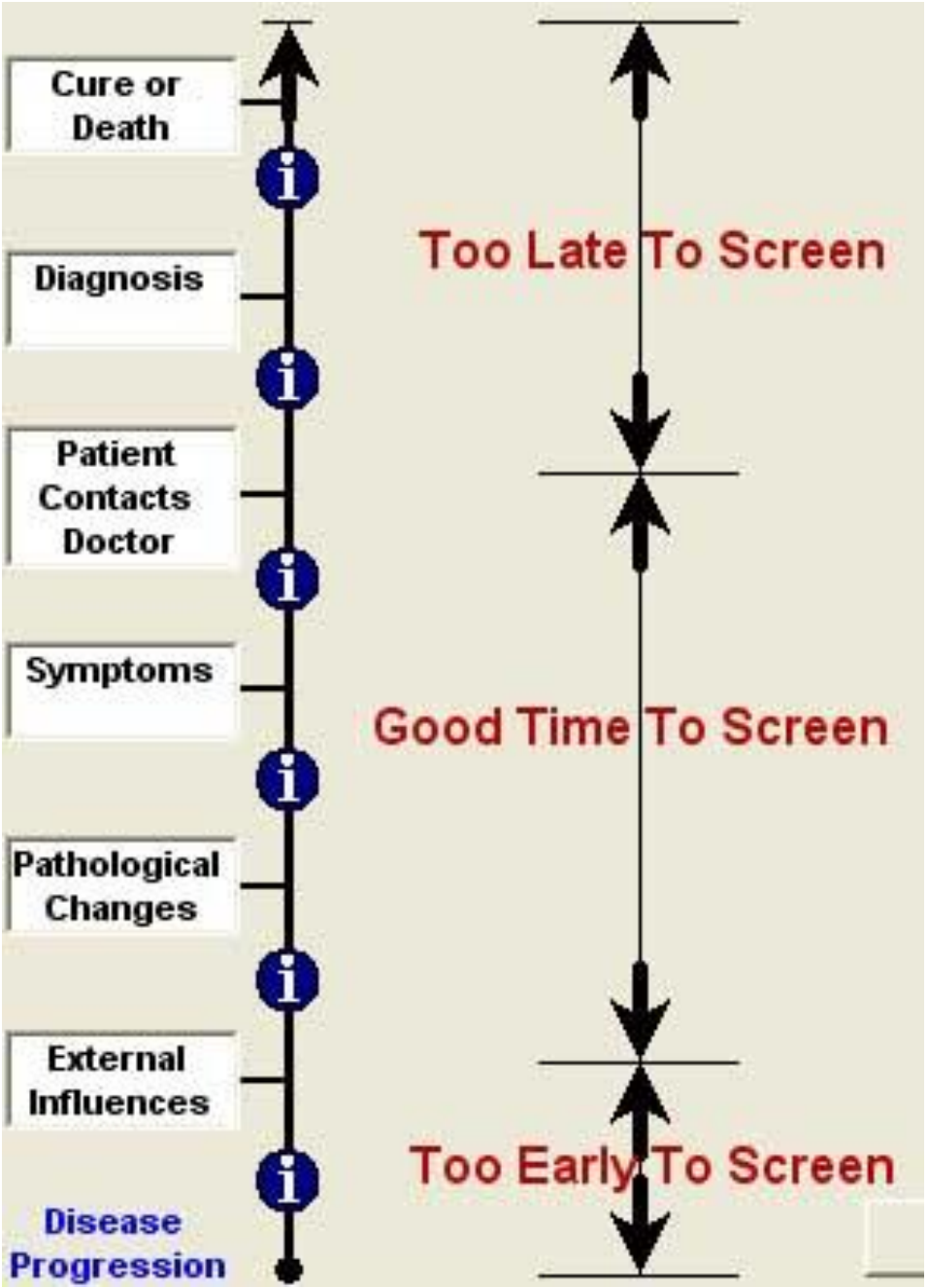
The Principles of Screening



- The choice of disease for which to screen;
- The nature of the screening test or tests to be used;
- The availability of a treatment for those found to have the disease;
- The relative costs of the screening.

Disease

- The disease must be an important health problem.
- There should be a recognizable latent or early symptomatic stage.
- The natural history of the disease, including latent to declared disease, should be adequately understood.



When to screen?

Test

- There should be a suitable test or examination.
- The test should be acceptable to the population.

Definition

- As the recipients of screening are usually people who have no illness it is important that the screening test itself is very **unlikely to cause harm**.

Screening and diagnosis

- Screening is a sorting process to segregate those who may have the condition
- It is an initial step, as it needs further confirmation
- Diagnosis is a procedure to confirm or disprove the existence of a disease or abnormality

Both screening and diagnosis can be achieved by:

- Obtaining medical history
- Performing physical examination
- Application of laboratory or non laboratory tests
- Using standardized interviews

Comparison between screening and diagnostic tests

Screening tests	Diagnostic tests
Done to those who are apparently healthy or asymptomatic	Done to those with suggestive signs or symptoms
Applied to a group of individuals	Applied to a single person
Results are based on one criteria	Results are based on the evaluation of a number of symptoms, signs and investigations
Results are not conclusive	Results are conclusive and final

Comparison between screening and diagnostic tests

Screening tests	Diagnostic tests
Less accurate	More accurate
Less expensive	More expensive
Not a basis for treatment	Basis for treatment

Uses of screening programs

- **Case detection / high risk/ carrier**

➢ Identification of unrecognized disease or pathological condition which does not arise from patients' request

- **Control of diseases**

➢ To prevent transmission of disease to healthy community members

- **Research purposes**

➢ Screening may be conducted to estimate the prevalence of a disease and subsequent screening will provide data on the incidence

TYPES OF SCREENING:

- **Mass Screening:**

Involves the screening of the whole population

- **Targeted Screening:**

of groups with specific exposures e.g. adults, school children, industrial (occupational) workers

- **High risk or selective screening**

Applied to selective group of population who are at a high risk e.g. cancer cervix in women at high risk

- **Multiple or multiphasic screening** uses several screening tests at the same time

Criteria for effective screening

1- Disease

2- Screening Test

Suitable disease for screening

Not all diseases are suitable for a screening program.

A suitable disease for a screening should satisfy the following characteristics:

1) The disease should be a major public health problem, and should have serious consequences such as severe prolonged morbidity or be fatal.
2) It should have a detectable preclinical phase (DPCP),
3) It should have high prevalence among screened persons.

A suitable disease for a screening should satisfy the following characteristics:

4) There should be a suitable screening test available, that can detect the disease or the defect prior to the signs and symptoms

5) There is good evidence that early detection reduces morbidity and mortality

6) Facilities should be available for confirmation of diagnosis

A suitable disease for a screening should satisfy the following characteristics:

7) There should be **effective and acceptable treatment** for the disease if identified in early stages. It is not reasonable to screen for untreatable disease.

8) The **expected benefits** of early detection out-weight the risks and costs

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Characteristics of a Suitable Screening Test

A. Reliable: does the test gives the same result when repeated applications are made on the same individual?

B. Acceptable to the public

C. Easy to apply

D. Risks vs. benefits

E. Costs:

- Costs of applying the test itself
- Costs of performing additional confirmatory tests

Characteristics of a Suitable Screening Test

F. Validity; as measured by its:

- Sensitivity.
- Specificity.

Validity

The validity of the test refers to the extent to which the test is capable of correctly diagnose the presence or absence of the disease concerned or the pre-disease state.

Validity

" true" disease status is determined by the most definitive diagnostic method, referred to as a "gold standard".

Sensitivity and specificity are used to describe the performance of the screening test relative to the true disease status.

Outcomes of a Screening Test

	True Disease Status		
Screening Test	**Positive**	Negative	Total
Positive	True Positives (TP) A 	False Positives (FP) B 	TP+FP
Negative	False Negatives (FN) C 	True Negatives (TN) D 	FN+TN
Total	TP+FN	FP+TN	TP+FP+FN+TN

Performance characteristics of a test

Sensitivity and specificity

		Disease		
		Present	Absent	Total
Test	Yes	90	5	95
	No	10	95	105
Total		100	100	200

1. Pre-test Probability-Prevalence=100/200=0.50
2. Sensitivity=90/100=0.90
3. Specificity=95/100=0.95
4. Positive Predictive Value=90/95=0.947
5. Negative Predictive Value=95/105=0.904
6. Test Accuracy – The Proportion Of People, With Or Without The Disease, Correctly Identified By The Test=90+95/200=0.925

Performance characteristics (*PSA > 4.0) SABOR participants

	Prostate Cancer		
	No	Yes	Total
PSA ≤ 4.0	34	6	40
PSA > 4.0	30	10	40
Total	64	16	80

*Prostate-specific antigen

p = 0.264

Performance characteristics (Abnormal *DRE)

	Prostate Cancer		
	No	Yes	Total
Normal DRE	38	10	48
Abnormal DRE	26	6	32
Total	64	16	80

*Digital Rectal Exam

p = 0.819

R_x Treatment

- There should be an acceptable treatment for the patients with recognized disease.
- There should be facilities for diagnosis and treatment should be available.
- There should be an agreed policy on whom to treat as patients.

?$ Cost

- The cost of case finding (including diagnosis and treatment of patients diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole.
- Case finding should be a continuing process and not a "once for all" project.

Test result	Disease		
	Present	Absent	Total
Positive			17
Negative	3		83
Total	15		100

Calculate:

1. Sensitivity=
2. Specificity=
3. Positive Predictive Value=
4. Negative Predictive Value=
5. Prevalence=