



Public Health

Title : Screening tests

Lec no : Lecture 4

Done By : Abdulrhman alawnehh

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Natural history of disease

Screening

L4

Associate Professor Dr. Eman A. Al-Kamil

Dep. Of Community Medicine

Collage of Medicine

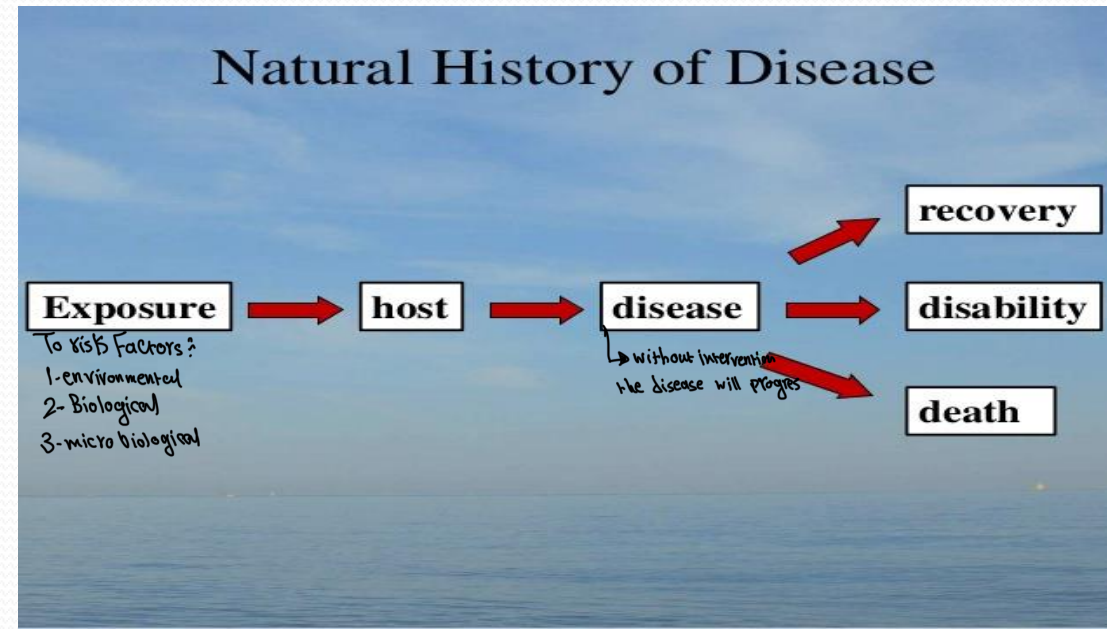
Hashemite University

*the patient have the risk factors and the pathological changes, but they do not have the signs and symptoms (subclinical stage of the disease).

Definition

- Natural history of disease refers to the **progress of a disease process in an individual over time**, in the **absence of intervention**.
- The process begins with **exposure to or accumulation** of factors capable of causing disease.
- **Without medical intervention**, the process ends with:

- Complete **recovery** ,
- **Incomplete recovery** → **Chronic**
- **disability**, or
- **death**.



Recovery Healing

What are the factors that prompt the healing process? There are a lot of factors which are called natural defense mechanisms such as the barriers we have talked about in immunology

Note: the sleeping pattern and the physical activity facilitate the healing process

- ❖ The body has an **amazing ability to repair itself after serious illness or injury**. (*natural healing process*)
- ❖ Each of us possesses a surprising capacity to bounce back from illness and injury, under the right conditions.
- ❖ Your body will work hard on its own to help you recover—even if you do little to help the process along. *spontaneous healing without you even know*
- ❖ Thousands of chemical and biological reactions occur throughout the day and night to help you to heal.
- ❖ When injured, white blood cells called neutrophils rush to the site, to ward off infection. Other blood cells called monocytes transform themselves into scavengers (macrophages), to engulf and devour dead tissue and help to control inflammation. If you break a bone, bone cells called osteoblasts kick into action to knit the rough edges back together.

But even though these processes are **involuntary and automatic**, there are things some patients can do:

The **best healing** occurs when patients are **able to optimize the immune system** to:

- avoid infections;
- encourage the healing of skin, bones, muscles, nerves, and tendons; and
- build strength and resolution.

we can increase our immunity b nutrition (especially some nutrients that are helpful in increasing the immunity such as vitamins)

There are an **eight-part strategy** to put patients on the path to **optimal healing**.

*we need vitamin A and vitamin D in order to help the skin and bones to heal
vitamin C is crucial for production of collagen
.
.
.*

The heart of this strategy are **three fundamentals**:

- how you **eat**,
- how you **sleep**, and *(7-8 hours of sleeping at night)*
- how you **move**.

STEP ONE: DON'T NEGLECT NUTRITION

People often read about **how to eat to avoid disease**. But once individuals get **sick**, there are also **foods that will help to get better**.

For example:

- **skin and bones** need **vitamin A** to repair themselves.
- **Vitamin C** is crucial to the **formation of collagen**, the main protein of the connective tissue.
- **Bromelain**, a **mixture of enzymes** found in fresh **pineapple**, **reduces swelling, bruising, and pain**, and it **improves healing time following trauma or surgery**.
- And **adequate protein** is essential for **optimal healing**.

STEP TWO: MAKE SLEEP A PRIORITY

- Normal people need **seven to eight hours of sleep** each **night**.
- During an **illness** a person may need **more rest** than that, because some of body's healing processes require sleep to work.

The retinal clock increases melatonin synth and release to a greater extent at night than in the day
- For example, the **hormone melatonin** is produced **during sleep**. This hormone is believed to **boost the immune system** and to **help repair corrupted DNA**.
- It may even play **a role in preventing some forms of cancer**. But if a person tossing and turning at night, melatonin levels can be diminished.

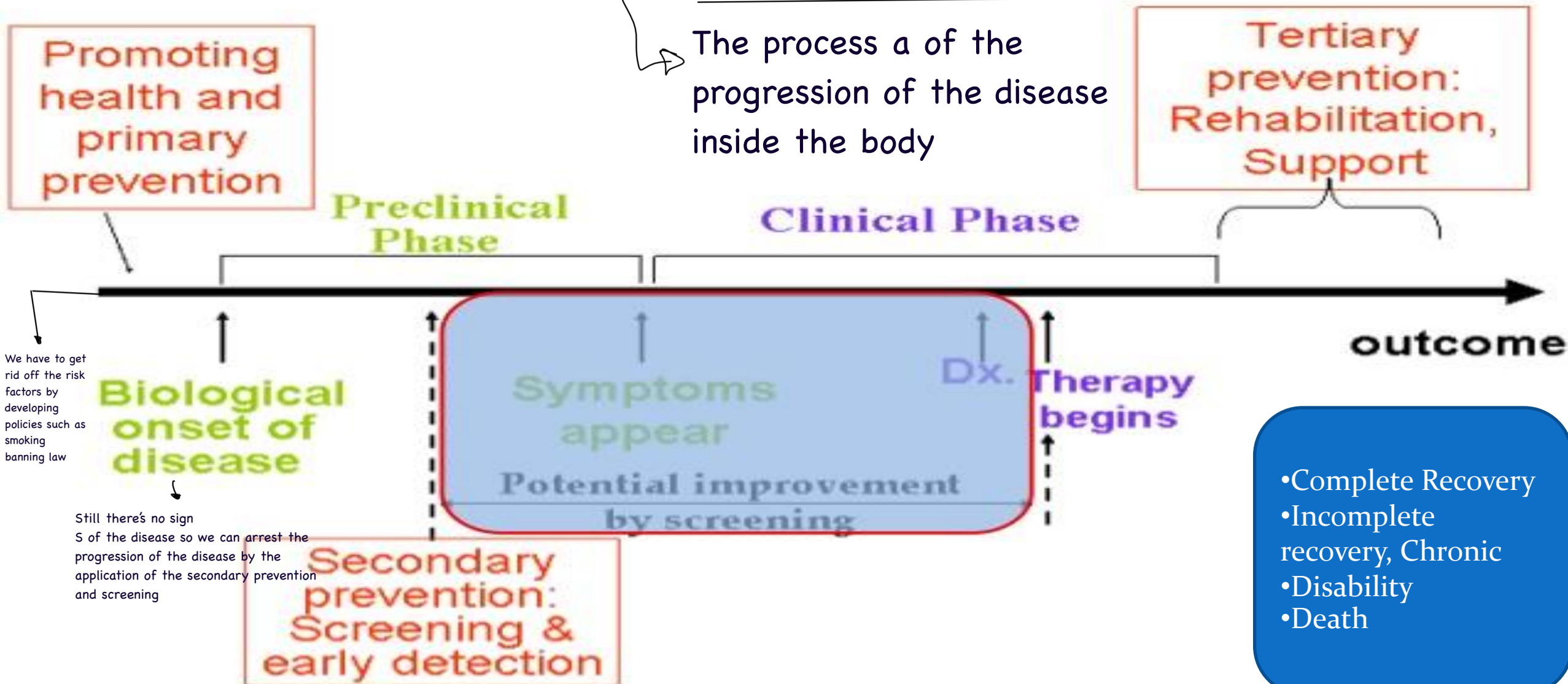
STEP THREE: GET YOURSELF MOVING

- Physical activity has a positive effect on what is called hemostasis: how the chemicals in the blood interrelate and work together.
- Exercise also improves the healing of muscles, bones, tendons, and ligaments.

For example, it spurs the formation of collagen,

- helping injured tissues heal properly.
- In addition, it appears to decrease the formation of excessive scar tissue, called fibrosis. *excessive fibrosis = keloid which is prominent*
- Exercise helps us heal better and faster.

Prevention and the Natural History of Disease



- Complete Recovery
- Incomplete recovery, Chronic
- Disability
- Death

بالعادة احنا بنشوف ال *severe cases* بالمستشفيات و لكن هناك فئة كبيرة من الناس عندهم المرض بس ما يروحوا على المستشفيات لعدة اسباب و هاهي الظاهرة تسمى *iceberg phenomenon*



Iceberg phenomenon

في التايتك (جاك وروز) لما شافوا قطعة الجليد من فوق فكروها صغيرة بعيين اكتشفوا انها من تحت كبيرة بعد لما عملت ثقب في السفينة و هيك في عنا مرضى بيجوش غير لما الوضع يصير كارثيبيبي يعني في ناس بطلعهم ورم في صدرهم بفكروه دمل وهو بكون ورم خبيث عافانا

Biggest Challenge in Preventive Medicine is to distinguish between people who have the disease and those who do not..

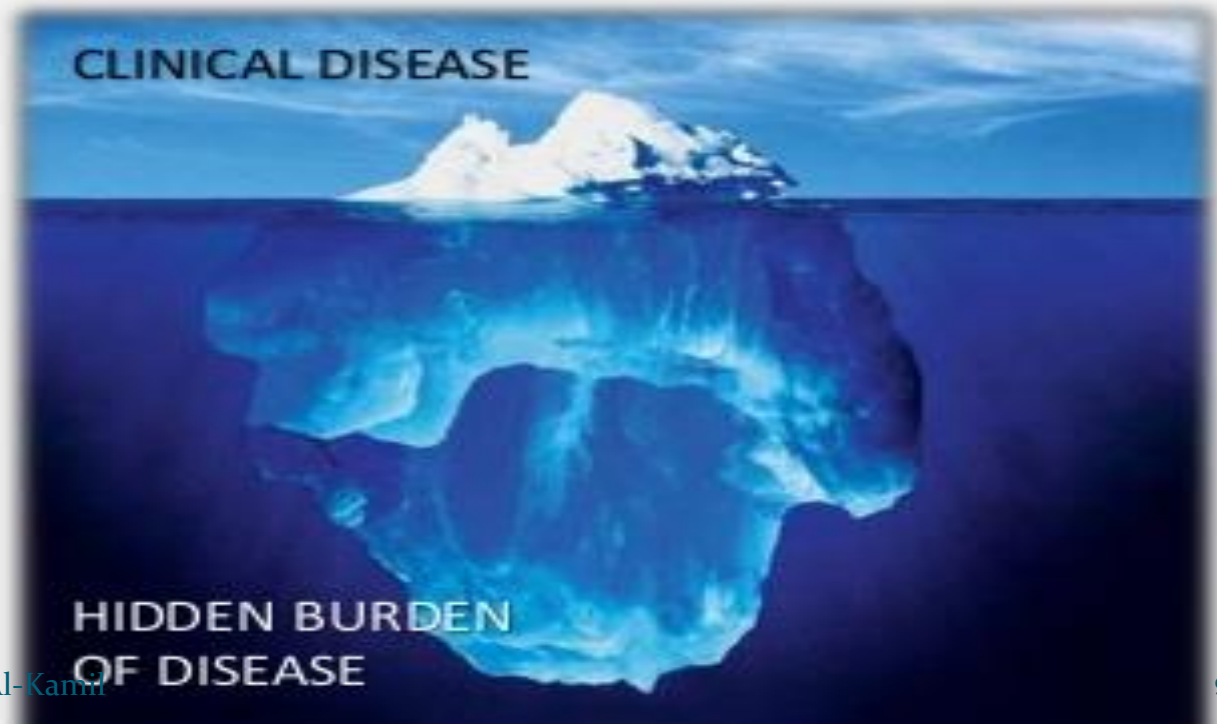
Iceberg phenomenon

What the **physician** sees in the **hospital** is just an "episode" in the natural history of disease.

➤ This gives an idea of progress of a disease from its subclinical stages to overt disease

HIDDEN: Subclinical cases, carriers, undiagnosed cases.

carriers of the infection: people who have the micro-organism but do not have signs and symptoms, and they can transmit the infection. examples are typhoid fever and hepatitis A.

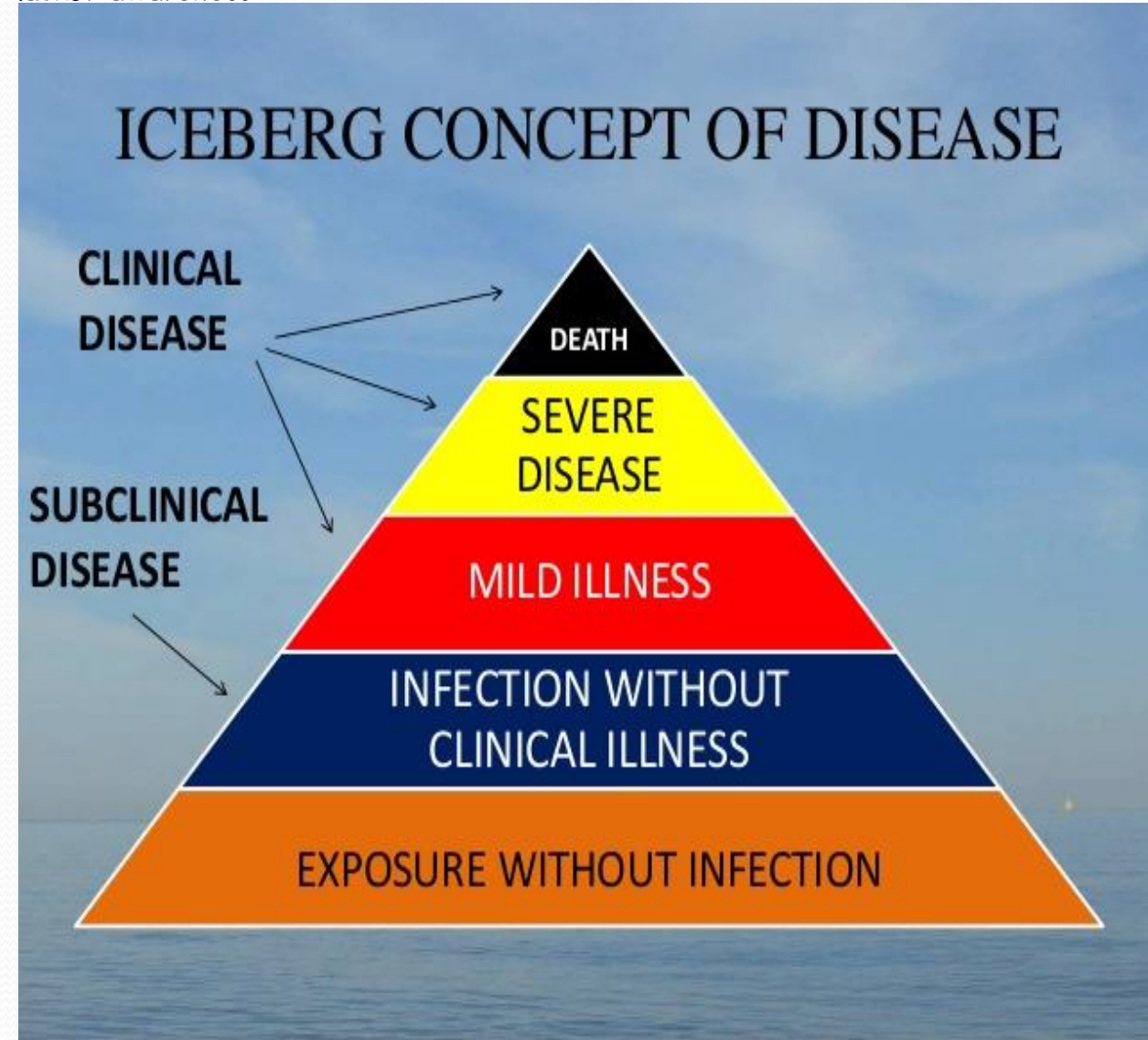


What are the barriers of health care services utilisation? Socialism , nationalism , lack of transportations and lackof awareness

سؤال خارجي

➤ Because of the clinical spectrum, cases of illness diagnosed by clinicians in the community often represent only the “tip of the iceberg.” Many additional cases may be too early to diagnose or may remain **asymptomatic**.

➤ For the public health worker, the challenge is that persons with undiagnosed infections may nevertheless be able to transmit them to others.



The Search for **unrecognized disease** or defect by means of rapidly applied tests, examinations or the other procedures in **apparently healthy individuals.**

early detection is achieved by certain screening tests (by physical examination or biochemical & microbial tests)

- Earlier it was to conserve physicians time for diagnosis, administer inexpensive lab tests etc.,



- But Today, Screening is considered a form of secondary prevention.

It detects disease in its early asymptomatic phase whereby early treatment can be given and disease can be cured or its progression can be delayed.`

Screening isn't a definitive diagnosis we need more investigations .

Screening

Is a form of secondary prevention

Such as screening for the family who has a risk for hypercholesterolemia

Screening people for **disease – or risk factors** which predict disease – is motivated by the potential benefits of **secondary prevention** through **early detection and treatment**.

Definition

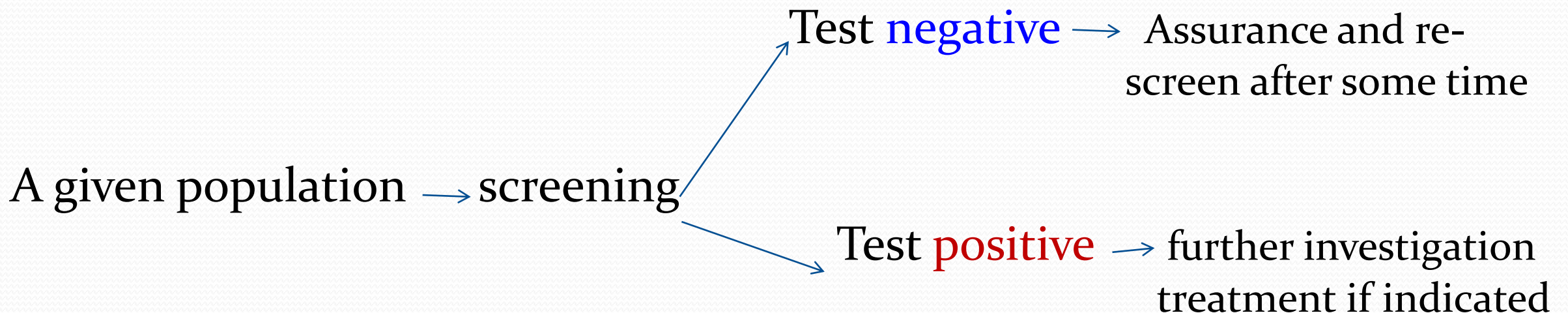
- ❑ Screening is the **process of using tests on a large scale to identify the presence of disease in apparently healthy people**. *they look healthy but may have the disease* → Subclinical cases
- ❑ Screening tests do **not usually establish a diagnosis**, but rather the **presence or absence of an identified risk factor**, and thus require individual **follow-up and treatment**.
after positive screening results, we need to apply further diagnostic tests. if the patient has the disease, then we will begin the medical intervention
- ❑ 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 can also be used **to identify high exposure to risk factors**.
- ❑ For instance, screening of **hearing impairment among** individuals working in the airport where they exposed to noises.
For instance radiologists has a monitoring device to detect the radiation

Screening sorts out those who
have The risk factors out those who
haven't

Screening is a medical **investigation** carried out on **apparently healthy** population in order to sort them out into those :

- who are likely to **have a disease** (who need further investigation to ascertain the disease presence and to decide on treatment) and
- those who are likely to **be free from the disease**.

Screening is achieved by the use of **rapid tests, examinations or other procedures**.



Screening is **useful** in the following aspects:

So we have to protect the people from
the subclinical cases

a. **Public health protection** particularly in case of serious communicable diseases i.e., screening of restaurant worker for salmonella typhi (typhoid fever) , health workers for Hepatitis B Virus or HIV.

contact screening: screening for those who had contact with infected people.
نساء المريض مع ميين التقى بالفترة الماضية ة بعدين نساء اللي التقوا معه كذلك و هاد نسميه *contact tracing* و بعدين نحصهم من العدوى

b. **Direct contribution to the health of individuals**. When disease is discovered earlier, its **treatment and outcome** are likely to be in favor of individual's interest.

c. **Research**, Data generated by screening can be used for research analysis.

USES OF SCREENING

1. CASE DETECTION: Prescriptive screening

هاد يكون الزامي من غير ما ناخذ موافقة الاشخاص

- Defined as “The presumptive identification of unrecognized disease, which does not arise from a patients request”.

Neonatal screening.

there are many neonatal screenings to detect health problems early in life such as phenylketonuria, hip dislocation, hypothyroidism...

⚡ It's so important to detect congenital dislocation of the hip in kids

The people are screened primarily for their own benefit.

in advanced nations

Guthrie test

Simple prick in the heel of the baby

Heel Prick Blood Sample

A routine blood test carried out on babies a few days after birth to detect the condition **phenylketonuria**.

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Associate Professor Dr.Eman A. Al-Kamil



→ في المستقبل

2. CONTROL OF DISEASE: Prospective screening → to detect the disease

People are examined for the benefit of others.

- Screening of **Immigrants** from infectious diseases like Ebola, Tb & Syphilis to protect the home population.
- Screening for **HIV, STD's** etc.,

STDs: sexual transmitted diseases

Screening programme may, by leading to early diagnosis permit more effective treatment and **reduce the spread of infectious disease and mortality.**



3. RESEARCH PURPOSES:

- To know **the history** of many chronic diseases like cancer, HTN etc.
- Screening may aid in obtaining more basic knowledge about the natural history of such diseases.



*Initial screening provides a **prevalence estimate** and*

الناس عندهم المرض حالياً
↳

Such as screening for HTN

*subsequent screening provides an **incidence figure**.*

↳ new cases on the same group
↳ which was negative
17

TYPES OF SCREENING

1. MASS SCREENING *for all the population*

*Application of screening test to large, **unselected** population. Everyone in the group is screened regardless of the probability of having the disease or condition.*

- a) Visual defects in all school children *and IQ and hearing problems*
- b) Mammography in women for breast cancer
- c) Colonoscopy for occult blood. *occult blood: the presence of blood in stool but it is hidden*



October is the month of awareness of breast examination to detect breast cancers

2. HIGH RISK / SELECTIVE / TARGETED SCREENING

The screening of selected high-risk groups in the population.

مثلاً مجموعة الساملين

- a) Screening fetus for Down's syndrome in a mother who already has a baby with Down's syndrome *or other congenital diseases*
- b) Screening for familial cancers, HTN and DM
- c) Screening for CA Cervix in low SES women *and sexually active women*
- d) Screening for HIV in risk groups.

SES: socioeconomic status

people at high risk of developing AIDS disease: sexually active, drug and alcohol abusers.



3. MULTIPURPOSE SCREENING بنفحص اكثر من مرض بنفس الوقت

The screening of a population by more than one test done simultaneously to detect more than one disease

- a) screening of pregnant women for VDRL, HIV, HBV by serological tests *VDRL: a screening test for syphilis*

4. MULTIPHASIC SCREENING

The screening in which various diagnostic procedures are employed during the same screening program.

- a) DM – FBS, Glucose tolerance test
- b) Sickle cell anemia – CBC, Hb electrophoresis

CRITERIA FOR SCREENING

- Before initiating a Screening Programme, a decision must be made whether it abides to all the ethical, scientific and financial justification.

ethical: you must explain the procedure to the patient and gain consent...

scientific: the screening is scientifically approved

financial: not expensive

*The principles that should govern the introduction of screening programmes were first enunciated by **Wilson and Junger (1968)***

- The Criteria for Screening is based on two considerations:
 - DISEASE
 - SCREENING TEST.

PRINCIPLES OF SCREENING

DISEASE CHARACTERISTICS

- Serious & relatively common
- Natural history – clearly understood
- Acceptable & effective treatment.

• The problem or disease is an important public health problem

TEST CHARACTERISTICS

- Acceptable to the population
- Easy to perform
- Relatively inexpensive
- Valid & reliable

رح نحكي عنهم
بلمحاضرات القادمة

- Harmless

SYSTEM CHARACTERISTICS

- Resources for diagnosis & treatment of disorder must be accessible.

1. DISEASE

- The Disease should be important Health problem (High Prevalence)- **TB**
- Disease should have Long & Detectable Preclinical stage.
- The Natural history of disease should be adequately understood.
- Appropriate test must be available for early detection of disease (before signs and symptoms appear)

- Facilities must be available for diagnosis of disease
(Confirmation/ Gold standard) *gold standard: the diagnosis which confirm the disease. for example gold standard for cancers is the histopathological tests*
- Early detection of disease and treatment should be able to reduce mortality & Morbidity.
- The disease should be treatable, and there should be a recognized treatment for lesions identified following screening.
- Expected benefits must exceed risks and costs.

↰ Benefit-Risk Ratio ↱

2. SCREENING TEST

- a) Inexpensive & Easy to Apply- (Simplicity)
- b) Acceptable
- c) Valid
- d) Reliable



SIMPLICITY

يعني الاجراءت سهلة

The test should be simple to perform, easy to interpret and, where possible, capable of use by paramedics and other personnel.



Ex: Blood and urine tests and ECG for early detection of hypertension

ACCEPTABILITY

- Since participation in screening is voluntary, the test must be acceptable to those undergoing it.
- In general tests that are painful, discomfoting or embarrassing are not likely to be acceptable.

Ex: Screening for prostrate cancer might not be acceptable to a large proportion of the community.

rectal examination is done to detect prostate hypertrophy. the test is embarrassing for many people



**FIND
OUT NOW.**

WHAT IS VALID AND RELIABLE?

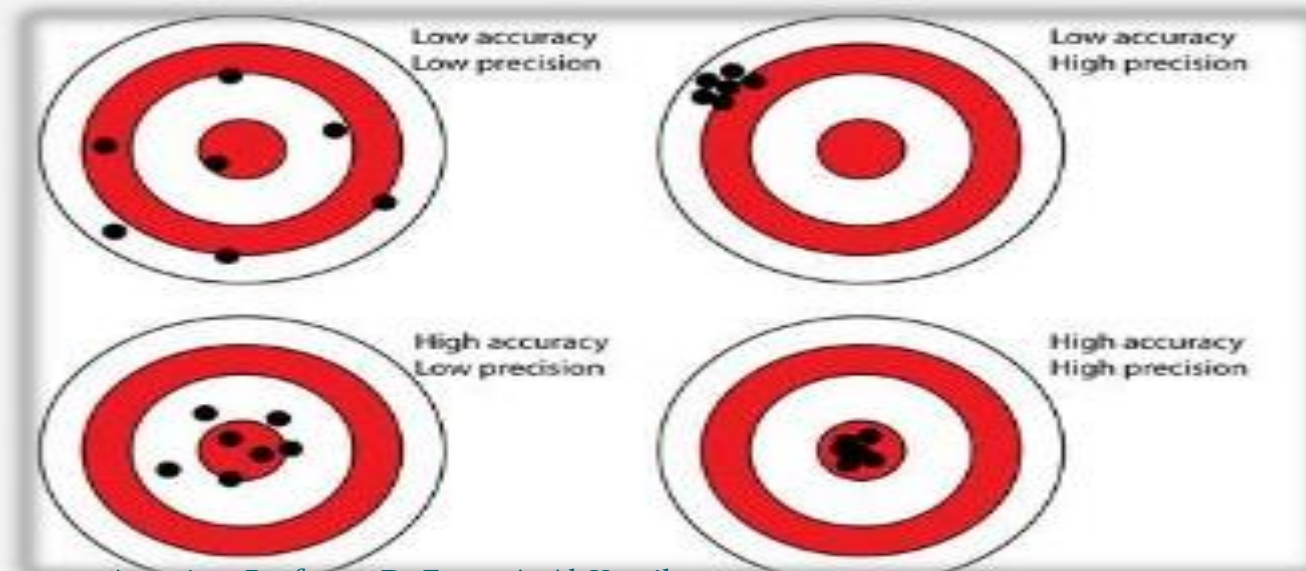
VALIDITY IS THE ACCURACY OF A TEST.

RELIABILITY IS THE PRECISION OF A TEST.

ACCURACY: “how close is result of a test to its true value?”

PRECISION: “how close are the results of a test on repetition?”

يعني هل النتيجة هي نفسها
في كل مرة نعيد الفحص او
لا؟



SCREENING TEST vs DIAGNOSTIC TEST

Screening test

1. Done on apparently healthy individuals
2. Applied to groups
3. Screening test is not final → Referral
4. Based on one criteria and cut-off
5. Less accurate
6. Less expensive
7. Not a basis for treatment
8. Initiative comes from investigator

Diagnostic test

1. Done on sick or ill individuals
2. Applied on single patient
3. Diagnostic test is final
4. Based on evaluation of a no. of signs/symptoms & lab findings
5. More accurate
6. More expensive
7. Used as a basis for treatment
8. Initiative comes from a patient



Thank You