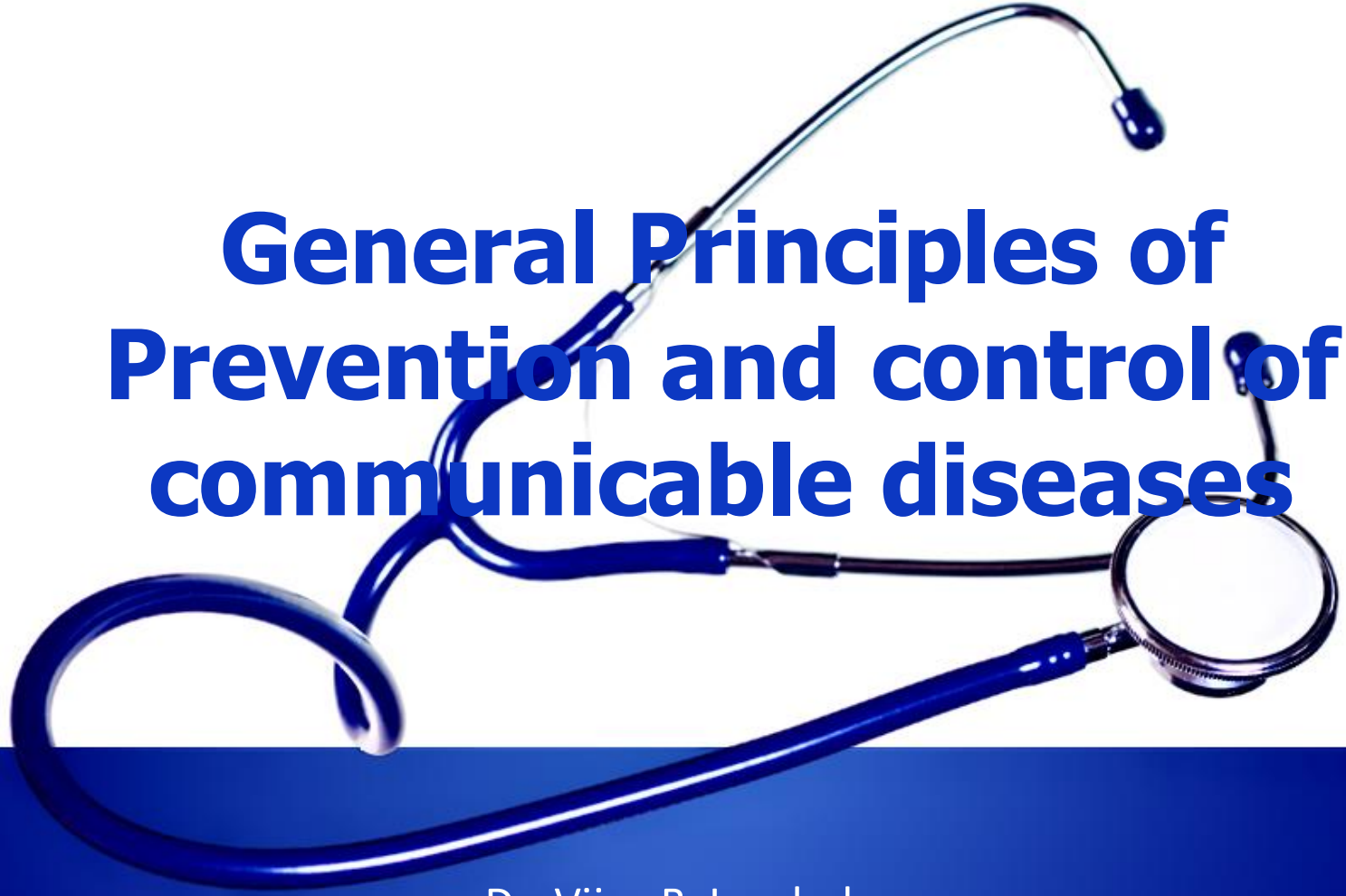

General Principles of Prevention and control of communicable diseases

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OBJECTIVES OF THE LECTURE

By the end of this lecture you will be able to:

- Identify measures for prevention and control of communicable diseases
  - Measures towards reservoir
  - Measures towards the MOT /environment
  - Measures to contacts and susceptible host
- Identify the levels of prevention of diseases

Prevention

Actions aimed at eradicating, eliminating, or minimizing the impact of disease and disability, or if none of these is feasible, retarding the progress of disease and disability.

The concept of *prevention is best* defined in the context of *levels of prevention; primary, secondary,* and tertiary prevention.

(Oxford Dictionary 2008)

Control & Elimination of disease

CONTROL: Disease incidence is reduced to a minimal level, acceptable at the level of country/region, at which the disease is no longer considered a public health problem, while infection may still occur.

ELIMINATION: Reduction to zero of the incidence of a specified disease in a defined community or country or region as a result public health actions.

Eradication

It means worldwide disappearance of a disease i.e. (permanent reduction to zero level) :

- The organism may be present only in laboratories, but there is no need for public health actions. e.g. smallpox since 1979.

Cycle of infection and interventions applied at each link

The cycle of infection has three major links:

- Reservoir& source
- Mode of transmission
- Susceptible Host

In general, control measures should be directed towards the link in the infection chain is most susceptible to interference.

Cycle of infection and interventions applied at each link

-Surveillance/quarantine
-Chemoprophylaxis
-Sero-prophylaxis
-Vaccination

Host

-Isolation of cases
-Treatment
-Disinfection
-Control of carriers
-Control of animals

Reservoir& Source

Mode of transmission

-Prevention of overcrowding
-Personal hygiene
-Vector control
-Environmental sanitation

Measures towards Reservoir

Objective of control measures towards reservoir

- Reduce quantity of agent (complete or partial reduction)
- Reduce communicability

Measures towards cases

Measures towards carriers

Measures towards animal reservoir

Measures towards cases

- Case finding (early detection/screening)
- Reporting
- Segregation /isolation of cases
- Treatment of cases
- Disinfection

Measures towards cases

Segregation/Isolation of cases

This means that the patient is isolated from the community in a fashion that prevents direct or indirect spread of infectious agents.

- Isolation is usually done for a period which equals the "period of communicability" at a hospital (fever hospital) or at home. Ideally repeated negative sample are needed before his release.

Measures towards cases

Treatment of cases

- Early diagnosis and prompt treatment of infections with appropriate regimens (e.g. antibiotics, antiviral or other chemotherapeutic agents) helps reducing communicability.

Measures towards cases

Disinfection

-Concurrent

-Terminal

Disinfection of the soiled articles by the patient discharges or excreta concurrently (during his presence as source of infection) and/or terminally (after his discharge from the hospital or death) helps in reduction of communicability.

Disinfection of contaminated objects with appropriate "enteric precautions," "respiratory precautions," "universal precautions"

Measures applied to carriers

1. Detection of carriers:
   - If they represent important reservoir of infection.
   - If they were suspected in a closed community, such as boarding schools, army barracks, food handling places,…..
2. Exclusion from work: in certain occupations for example;
   - food handler (e.g. Typhoid carrier) or a
   - teacher (e.g. Diphtheria carrier).
3. Treatment for the carrier state (when applicable).

Measures applied to animal reservoir

- Inspection and slaughtering of infected animals (in bovine tuberculosis)
- Testing and immunization of uninfected sheep, cattle (in brucellosis)
- Careful husbandry and sterilization of animal products (in anthrax).
- Extinction/Destruction of animal reservoir has been successful with diseases as **rabies** and bovine TB in several countries. Such procedure is only possible for domestic animals while it is difficult or almost impossible for wild animals (e.g. in jungle yellow fever,….)

Measures to Contacts/ susceptible Host

- Surveillance/observation
- Quarantine
- Increasing resistance of susceptibles

Measures to Contacts/ susceptible Host

- **Surveillance** means close medical supervision of the contacts, without restricting their movement, for the purpose of early detection of the disease in question.
- Surveillance should be done for duration of the longest "incubation period" of the disease counted from date of last exposure.

Quarantine

- Quarantine means separation (with restriction of the movement) in a specific place (quarantine) of apparently well persons or animals who have been exposed (**contact**) to a case of infectious disease.

- Quarantine is done for the duration of the longest "incubation period" of the disease counted from date of last exposure. It allows early detection of the disease among these individuals.
- This measure is applied for contacts of *pneumonic plague* and *pneumonic anthrax*.

Increasing resistance of susceptibles

Measures to improve the defense mechanism of the host by using:

- Chemoprophylaxis,
- Sero-prophylaxis,
- Immunization.

Increasing resistance of susceptibles

a) **Chemoprophylaxis:** The administration of a chemical, including antimicrobials, to prevent the development of an infection (if given before exposure)

or to slow progression of the disease to active clinically manifest disease (if given after exposure).

Increasing resistance of susceptibles

Chemoprophylaxis is used for travelers to endemic areas, occupationally exposed persons (e.g. Health Care Workers) and for contacts in closed communities as in camps, schools and institutions.

Examples:

1. Isoniazid (INH) for contacts of tuberculous cases.
2. Rifampicin for contacts of meningeococcal meningitis.
3. Chloroquine for travelers to malaria areas.

Increasing resistance of susceptibles

b) **Sero-prophylaxis**: prophylaxis using ready-made antibodies also known as passive immunization

(e.g. measles immunoglobulin and tetanus anti tetanic serum (ATS)

In case of measles, if it is given within the first three days of the incubation period, it prevents the attack and gives immunity for 4-5 weeks.

If administered from the 4th to the 10th day of IP, the subject gets a modified attack and permanent immunity.

Increasing resistance of susceptibles

c) Vaccination (Active immunization):

Protection of susceptible host from communicable diseases by the administration of a modified living infectious agent, killed organism, or inactive agent or part of the agent.

Measures towards the environment

- Reduction of overcrowding (better housing conditions, proper ventilation)
- Personal hygiene (cleanliness, hand washing, regular bathing)
- Environmental sanitation: (e.g. sanitary sewage disposal, sanitary refuse disposal, safe water supply,…)

Measures towards the environment

- Vector control (insecticides, indoor or aerial spraying, mosquito-nets,…..
- National and international measures: which include different public health measures undertaken within and between countries in order to protect the individuals and communities from communicable diseases.

Cycle of infection and interventions applied at each link

-Surveillance/quarantine
-Chemoprophylaxis
-Sero-prophylaxis
-Vaccination

Host

-Isolation of cases
-Treatment
-Disinfection
-Control of carriers
-Control of animals

Reservoir& Source

Mode of transmission

-Prevention of overcrowding
-Personal hygiene
-Vector control
-Environmental sanitation

Choice of appropriate prevention & control measures

The choice of the control measure is disease dependent.

It depends upon the knowledge of:

- Natural history, causation and dynamics of disease transmission
- identification of risk factors and high risk groups
- availability of tools of intervention (vaccine chemoprophylaxis or treatment,..)

Levels of Prevention

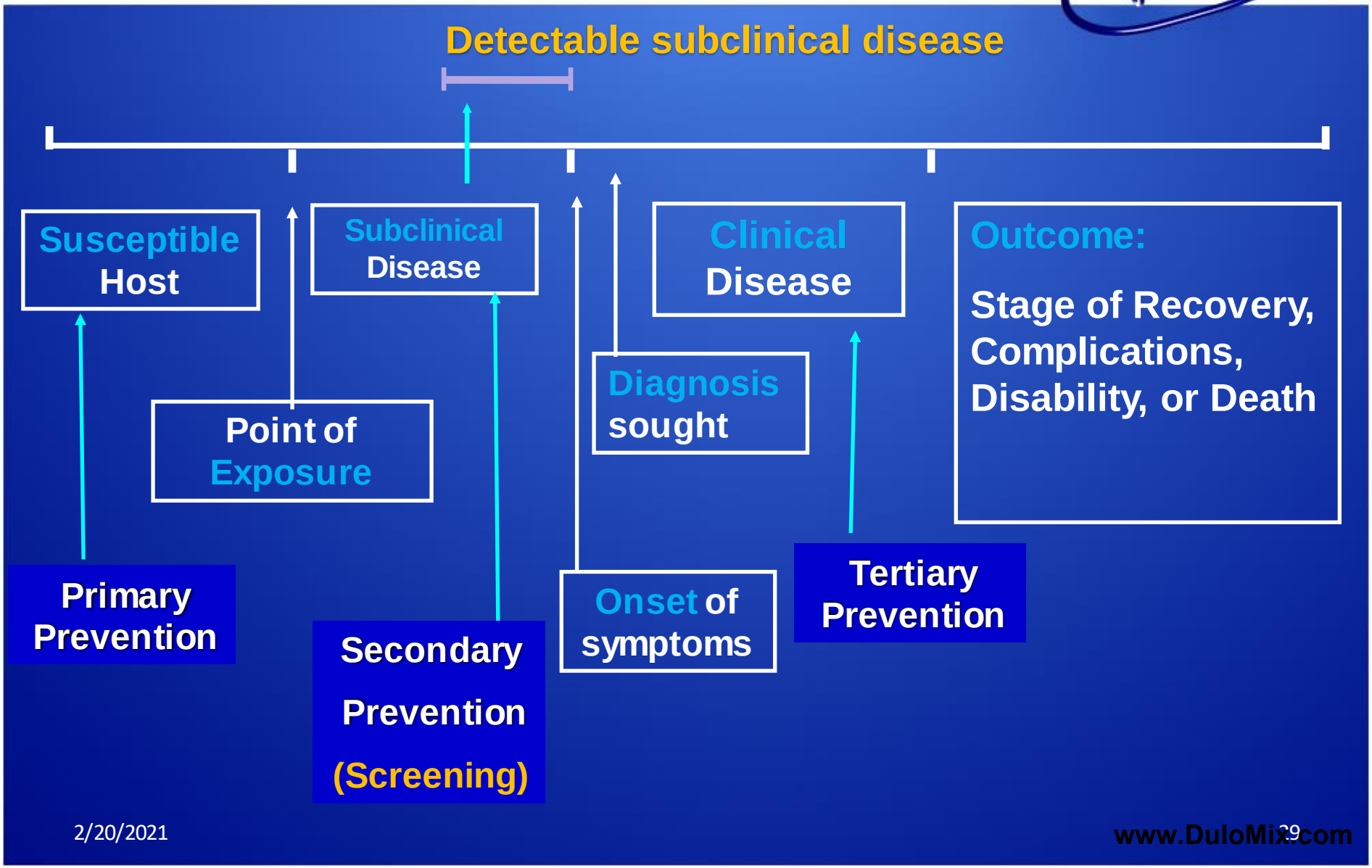
- Primary prevention => pre-event phase
- Secondary prevention => event phase
- Tertiary prevention => post-event phase

Health Promotion (1ry prevention)

Early detection & care (2ry prevention)

Rehabilitation (3ry prevention)

Natural History of Disease



I- Primary Prevention:

Actions taken prior to the onset of the disease which aim to remove the possibility that a disease will ever occur"

It limits the incidence of diseases by preventing healthy people from developing disease.

Primary Prevention activities can be directed at individuals or at the environment.

At individual level

Measures to improve the general health of the individuals:

1. Health education efforts are directed at encouraging people to develop good health habits (Adequate nutrition, exercise) and to adopt hygienic practices (hand washing,….
2. Specific protective measures such as, chemoprophylaxis, sero-prophylaxis, vaccination

At environmental level

Environmental sanitation is used to provide an adequate sewage system, safe drinking water, clean air and proper ventilation.

II- Secondary Prevention:

It is the early detection and prompt treatment of a disease, thus hinder the progress of a disease and prevent complications. i.e. intervention in early pathogenesis phase.

Measures of secondary prevention include:

1. Screening programs are used to detect diseases at early preclinical stages, when effective therapy may either cure the disease or limit its progression

2. Primary medical care: through early case finding at PHCC. It is the predominant form of secondary prevention.

III- Tertiary prevention:

Actions taken when the disease process has advanced beyond its early stages

i.e. intervention in late pathogenesis phase.

The aim of tertiary prevention is limitation of disability and rehabilitation from disease.

Tools for tertiary prevention include rehabilitation

Rehabilitation:

It is a measure to train disable individuals to reach the highest level of functional ability by using combined coordinated medical, social, vocational, psychological and educational measures.

Rehabilitation includes:

1. Medical rehabilitation – restoration of function or physical loss.
2. Educational rehabilitation change of educational methods.
3. Vocational (occupational) rehabilitation – restoration of the capacity to earn a livelihood.
4. Social rehabilitation: restoration of family and social relationships.
5. Psychological rehabilitation: restoration of personal confidence.

Examples of uses of levels of prevention

All three levels of prevention can be used to control a single disease process.

1. BCG Vaccination of newborns (primary prevention).
2. Screening and early treating a person with active tuberculosis (secondary prevention) may prevent transmission to another person (primary prevention).
3. In advanced cases of tuberculosis, occupational and social rehabilitation (tertiary prevention) by modification of working conditions may help to regain the capacity to earn his livelihood.

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