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ENVIRONMENTAL STUDIES & LIFE SCIENCES

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ENVIRONMENTAL STUDIES & LIFE SCIENCES

Types of Infectious diseases

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Infectious diseases

Significantly contribute to the mortality in

- Elderly
- Immunosuppressed
- Chronic disease states

How microorganisms cause disease?

- Humans harbor a complex ecosystem of microflora.
- Attenuation of normal host- defense healthy” microbial flora to cause pathologic infections.
- Non-commensal organisms with a wide range of virulence.
- Highly infectious microbes produce disease in healthy individuals.

Bloodborne Diseases:

- HIV/AIDS.
- Hepatitis B and C.

- Bacterial:
 - “Staph” skin infection.
 - Pneumonia.
 - Urinary tract infection.
 - Anthrax
 - Botulism
- Parasitic: Malaria
- Viral:
 - Influenza, or the flu.
 - Respiratory infections.
 - Diarrhea.
 - Chickenpox, measles, mumps.
- Fungi:
 - Candidosis, Aspergillosis.

Infectious diseases: Definitions

- **Disease:** A pathological condition of body parts or tissues characterized by an identifiable group of signs and symptoms.
- **Infectious disease:** Disease caused by an infectious agent such as bacteria, virus, fungi, protozoa that can be passed on to others.
- **Infection:** Occurs when an infectious agent enters the body and begins to reproduce; may or may not lead to disease.
- **Pathogen:** An infectious agent that causes disease.
- **Host:** An organism infected by another organism.
- **Virulence:** The relative ability of an agent to cause rapid and severe disease in host.

Phases of infectious disease

- 1. Incubation period:** time between infection and the appearance of signs and symptoms.
- 2. Prodromal phase:** mild, nonspecific symptoms that signal onset of some diseases.
- 3. Clinical phase:** a person experiences typical signs and symptoms of disease.
- 4. Decline phase:** subsidence of symptoms.
- 5. Recovery phase:** symptoms have disappeared, tissue heal and the body regains strength.

Classification of disease

□ By duration

- *Acute: develop and runs its course rapidly
- *Chronic: develops more slowly and it usually less severe may persist for a long, indefinite period of time.
- *Latent: characterized by periods of no symptoms between outbreaks of illness.

□ By location

- *Local: confined to a specific area of the body
- *Systemic: a generalized illness that infect most of the body

□ By timing

- *Primary: initial infection in the previously healthy person
- *Secondary: infection that occurs in a person weakened by primary infection

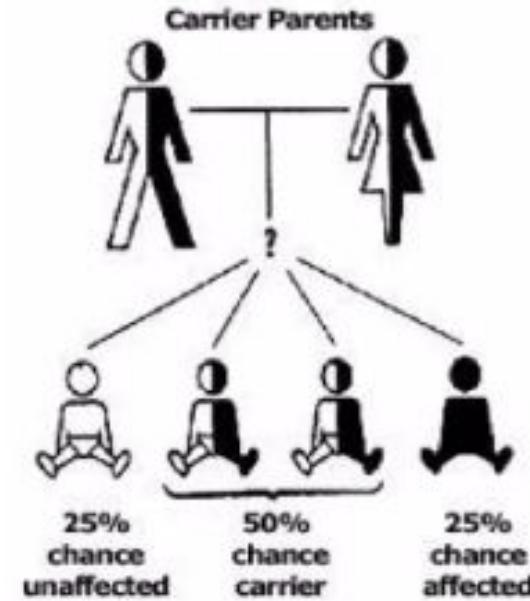
Types of Infectious diseases

Table 14.10 Modes of Disease Transmission

Mode of Transmission	Diseases Spread Include:
Contact Transmission	
Direct Contact: e.g., handshaking, kissing, sexual intercourse, bites	Cutaneous anthrax, genital warts, gonorrhea, herpes, rabies, staphylococcal infections, syphilis
Indirect Contact: e.g., drinking glasses, toothbrushes, toys, punctures	Common cold, enterovirus infections, influenza, measles, Q fever, pneumonia, tetanus
Droplet transmission: e.g., droplets from sneezing (within 1 meter)	Whooping cough, streptococcal pharyngitis (strep throat)
Vehicle Transmission	
Airborne: e.g., dust particles	Chickenpox, coccidiomycosis, histoplasmosis, influenza, measles, pulmonary anthrax, tuberculosis
Waterborne: e.g., streams, swimming pools	Campylobacter infections, cholera, Giardia diarrhea
Foodborne: e.g., poultry, seafood, meat	Food poisoning (botulism, staphylococcal); hepatitis A, listeriosis, tapeworms, toxoplasmosis, typhoid fever
Vector Transmission	
Mechanical: e.g., (on insect bodies) flies, roaches	<i>E. coli</i> diarrhea, salmonellosis, trachoma
Biological: e.g., lice, mites, mosquitoes, ticks	Chagas' disease, Lyme disease, malaria, plague, Rocky Mountain spotted fever, typhus fever, yellow fever

Diseases

- Genetic
- Biological
- Physical
- Chemical



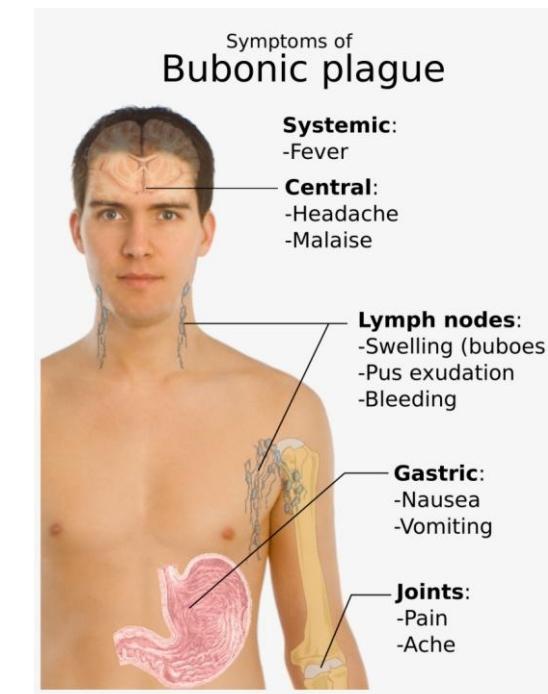
Types of Infectious diseases

Epidemics of

- Plague in India
- Avian (H5N1) influenza in Hong Kong
- Ebola haemorrhagic fever in central Africa
- Nipah virus (niv) infection in Malaysia and Singapore required national and international response.

Plague: Also called as Black Death

- *Yersinia pestis* causes plague. Transmitted from rodents to human by aerosols or fleabites.
- There are two main clinical forms of plague infection: bubonic and pneumonic.
- Bubonic plague is the most common form and is characterized by painful swollen lymph nodes or 'buboës'.
- The lymph node then becomes inflamed, tense and painful, and is called a 'bubo'.
- Inflamed lymph nodes can turn into open sores filled with pus.
- **Pneumonic plague**, or lung-based plague, is the most virulent form of plague.



Anthrax

- *Bacillus anthracis* causes anthrax in human.
- These are prevalent in animals having contact with spore-contaminated soil.
- Human in contact through exposure to contaminated animal products or powdered spores (called as a biologic weapon) suffer from anthrax.
- 3 major syndromes:
 - Cutaneous: painless, pruritic papules that become edematous vesicles (lymphadenopathy & lymphangitis) followed by a black eschar.
 - Inhalation: flu like symptoms rapidly leads to sepsis, shock, and frequently death.
 - GI: by eating contaminated meat, causes severe, bloody diarrhoea and often death.



Small pox

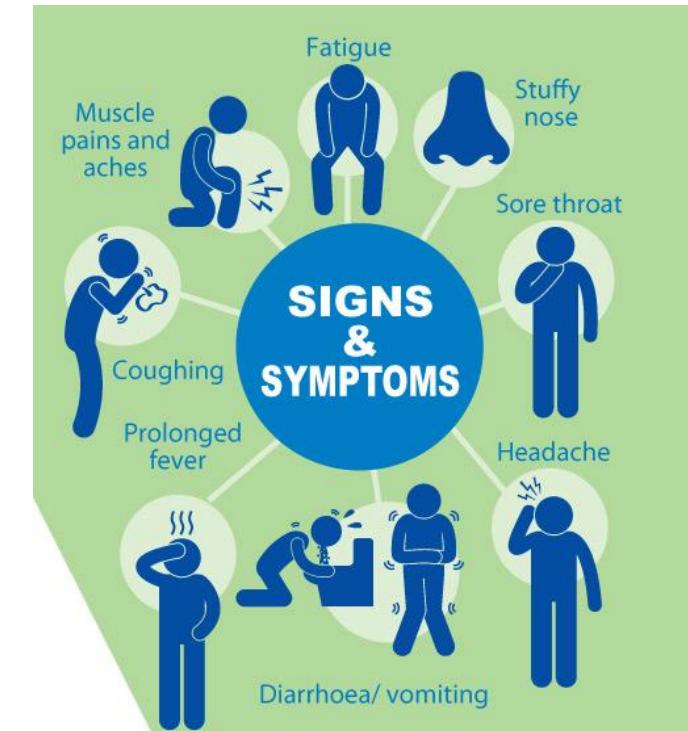
- acute contagious disease caused by the *Variola* virus
- **high fever which may be recurrent.**
- **malaise** (general feeling of unwellness)
- **widespread skin rash** – flat spots which change into raised bumps then firm fluid filled blisters which then scab
- **severe headache.**
- **backache.**
- **abdominal pain.**
- **vomiting.**
- **diarrhoea.**



Types of Infectious diseases

Influenza

- Acute contagious disease caused by influenza virus.
- Causes respiratory tract infection but symptoms throughout the body.
- Seasonal causes epidemics with low fatality. More deadly during pandemics and occur several times.
- Rapid onset, chills, fever, malaise/fatigue, headache, sore throat, cough, nasal congestion, & GI symptoms



Viral Hemorrhagic Fever

- Viral hemorrhagic (hem-uh-RAJ-ik) fevers are infectious diseases. Cause severe, life-threatening illness.
 - They can damage the walls of tiny blood vessels, making them leak, and can hamper the blood's ability to clot internal bleeding.
- Early signs and symptoms can include:
Fever, Fatigue, weakness or general feeling of being unwell, Dizziness, Muscle, bone or joint aches, Nausea and vomiting, Diarrhoea
Some viral hemorrhagic fevers include:

- 1.Dengue
- 2.Ebola
- 3.Lassa
- 4.Marburg
- 5.Yellow fever

□ Severe symptoms include:

Bleeding under the skin, in internal organs, or from the mouth, eyes or ears, Nervous system malfunctions, Coma, Delirium, major organ failure.

VIRAL HEMORRHAGIC FEVERS



<https://www.slideshare.net/ChristianAmarvi/viral-hemorrhagic-fever>

Tularaemia

- Tularaemia, also known as “rabbit fever,” is a disease caused by the bacterium *Francisella tularensis*.
- Tularaemia is typically found in animals, especially rodents, rabbits, and hares. Tularaemia is usually a rural disease and has been reported in all U.S. states except Hawaii.
- Symptoms: Rapid onset, fever, dyspnoea , headache, malaise, cough, hemoptysis (coughing up blood).



Botulism

- *Clostridium botulinum* is a bacterium that produces dangerous toxins (botulinum toxins) under low-oxygen conditions.
- Botulinum toxins block nerve functions and can lead to respiratory and muscular paralysis.
- Foodborne botulism is a serious, potentially fatal disease.
- Improperly processed food, homemade canned, preserved or fermented foodstuffs are a common source of foodborne botulism.

Symptoms: fatigue, weakness, blurred vision, difficulty in swallowing and speaking, descending muscle paralysis and respiratory failure.



Malaria

- ***Plasmodium falciparum*** causes severe malaria.
- ***Plasmodium vivax, Plasmodium ovale, and Plasmodium malariae*** are the various types of disease causing vectors.
- Malaria infection begins when an infected female ***Anopheles*** mosquito bites a person, injecting *Plasmodium* parasites, in the form of sporozoites into the bloodstream.
- The **sporozoites** pass quickly into the **human liver**.
- The sporozoites multiply asexually in the liver cells over the next 7 to 10 days, causing no symptoms.
- In an animal model, the parasites, in the form of **merozoites** are released from the liver cells in vesicles, **passes through the heart, lungs, and settle within lung capillaries**.

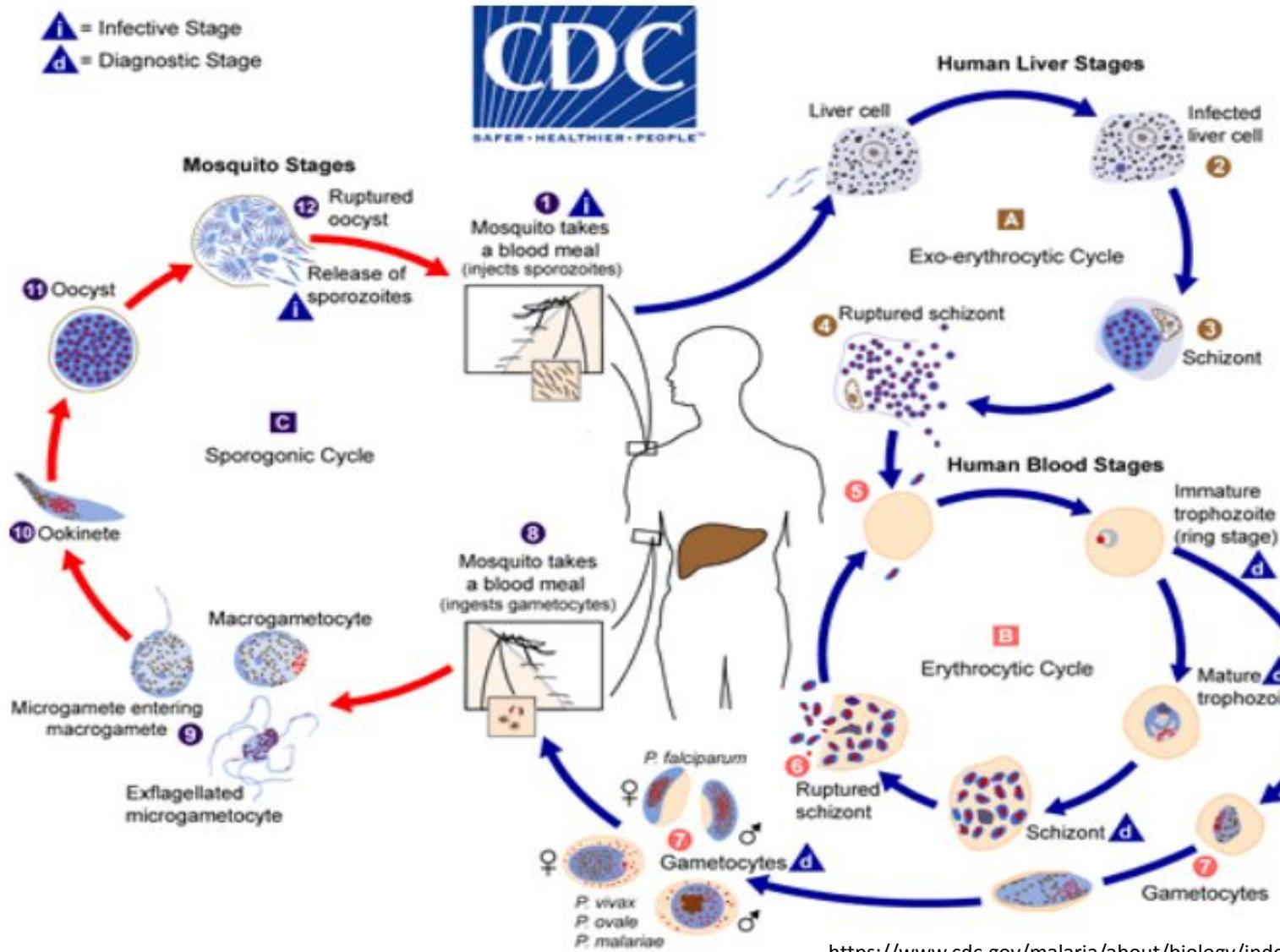
- The vesicles disintegrate, free the merozoites to enter the blood phase of their development.
- In the bloodstream, the merozoites invade red blood cells (**erythrocytes**) and multiply again until the cells burst. Then they invade more erythrocytes. This cycle is repeated, causing fever each time parasites break free and invade blood cells.
- Some of the infected blood cells leave the cycle of asexual multiplication. Instead of replicating, the merozoites in these cells develop into sexual forms of the parasite, called gametocytes that circulate in the blood stream.

Types of Infectious diseases

- When a mosquito bites an infected human, it ingests the gametocytes, which develop further into mature sex cells called gametes.
- The fertilized female gametes develop into actively moving ookinetes that burrow through the **mosquito's midgut wall and form oocytes on the exterior surface**.
- Inside the oocyst, thousands of active sporozoites develop. The oocyst eventually bursts, releasing sporozoites into the body cavity that **travel to the mosquito's salivary glands**.
- **The cycle of human infection begins again when the mosquito bites another person.**

Types of Infectious diseases

i = Infective Stage
d = Diagnostic Stage



Watch and Enjoy:

<https://www.youtube.com/watch?v=GfePed0F-f0>

Types of Infectious diseases

Bioterrorism acts and their functions.

ACTS	COUNTRY	YEAR	FUNCTIONS
The Pandemic and All-Hazards Preparedness Act (PAHPA)	United States	2006	Improve the nation's public health, medical preparedness and response capabilities in emergencies.
Public Readiness and Emergency Preparedness Act (PREP Act)	United States	2005	Protects from liability claims arising from administration, vaccine manufacturers, distributors, program planners, and qualified persons involved in the administration.
Biodefense and Pandemic Vaccine and Drug Development Act	United States	2005	Provides incentives for domestic manufacturing of vaccines and broad liability protections to the companies.
The Project Bioshield Act	United States	2004	Provides permanent funding for the procurement of medical countermeasures during emergencies.
Public Health Security and Bioterrorism Preparedness and Response Act (Bioterrorism Act)	United States	2002	Issue regulations on enhancing controls on dangerous biological agents and toxins, protecting safety and security of food and drug supply, drinking water Security and safety.
Homeland Security Act	United States	2002	Create the Department of Homeland Security (DHS), that prevent or minimize damage and assist in recovery for terrorist attacks
USA Patriot Act	United States	2001	Uniting and strengthening America by providing appropriate tools required to intercept and obstruct terrorism
Chemical and Biological Weapons Control Act	United States	1991	Strengthen efforts to control chemical and biological agents, precursors, and equipment.



THANK YOU

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Disease Management

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The condition of being sound in body, mind or spirit, especially freedom from physical disease or pain- **Health**

Factors influencing health:

- 1. Genetic disorders**- deficiencies a child born with & deficiencies/ defect child inherit
- 2. Infections**
- 3. Life style**- food & water, rest & exercise, habits

Any condition which interferes with normal functioning of the body and impairs the health- Disease

Types of Diseases:

- I. **Congenital Disease-** inborn disease & genetically inherited
- II. **Acquired Disease-** after birth & non- inheritable

Congenital Disease:

1. Disease due to gene mutation. Eg.- Haemophilia, Color blindness
2. Disease due to chromosomal mutation Eg.- Down's syndrome, Klinefelter's syndrome

Acquired Disease:

1. Communicable or infectious diseases- air, water, food, physical contact or vectors (Bacteria, Virus, Protozoa, Helminth, Fungus etc.)
2. Non- communicable or non- infectious diseases- Deficiency disease (Diabetes), Degenerative (Arthritis), Cancerous & Allergic diseases (Asthma)

- **Disease management** is a system of coordinated health care interventions and communications for defined patient populations with conditions where self-care efforts can be implemented.
- **Disease management** empowers individuals, working with other health care providers to **manage their disease** and prevent complications.

Improvements in quality of care and patient outcomes should be the primary indicator of successful **disease management**.

Infectious diseases can be caused by:

- **Bacteria.** These one-cell organisms are responsible for illnesses such as strep throat, urinary tract infections and tuberculosis.
- **Viruses.** Even smaller than bacteria, viruses cause a multitude of diseases ranging from the common cold to AIDS.
- **Fungi.**
- **Parasites.**

Common Infectious Diseases

- Chickenpox.
- Common cold
- Diphtheria.
- Giardiasis.
- HIV/AIDS.
- Influenza (flu)

Lifestyle diseases are ailments that are primarily based on the day to day habits of people.

Lifestyle diseases include

- atherosclerosis
- heart disease
- stroke
- obesity
- type 2 diabetes
- hypertension
- diseases associated with smoking and alcohol and drug abuse
- colon cancer, and
- premature mortality

A **chronic disease** affects every aspect of a person's life.

This can include physical and mental health, family, social life, finances, and employment.

Chronic diseases can also shorten a person's life.

Conditions such as asthma and diabetes require regular monitoring to prevent the disorders from progressing to life-threatening levels.

Chronic disease management, therefore, is **essential** to both improving health outcomes of poor individuals and containing costs in health care system.

Diseases can be grouped as:

1. Food & water borne diseases
2. Air borne diseases
3. Vector borne diseases

Food & water borne diseases:

- Proper personal hygiene include keeping the body clean; consumption of clean drinking water, food, vegetables, fruits, etc.
- Proper public hygiene which includes proper disposal of waste and excreta; periodic cleaning and disinfection of water reservoirs, pools, cesspools and tanks and observing standard practices of hygiene in public catering.
- Eg.- Typhoid (*Salmonella typhi*), Amoebiasis (*Amoeba*) and Ascariasis (*Ascaris*)

Air borne diseases:

- Close contact with infected person & their belongings should be avoided
- Personal hygiene is also very important to prevent diseases
- Eg.- Pneumonia and Common cold

Vector borne diseases:

- Controlling or eliminating the vectors and their breeding places.
- Avoiding stagnation of water in and around residential areas, regular cleaning of household coolers, use of mosquito nets
- Introducing fishes like *Gambusia* in ponds that feed on mosquito larvae, spraying of insecticides in ditches, drainage areas and swamps, etc.
- Doors and windows- wire mesh to prevent the entry of mosquitoes.
- Aedes* & *Culex* mosquitoes, Houseflies
- Malaria, Filariasis, Dengue and Chikungunya

Prevention or control of Diseases

- Infectious diseases can be prevented through maintenance of personal and public hygiene

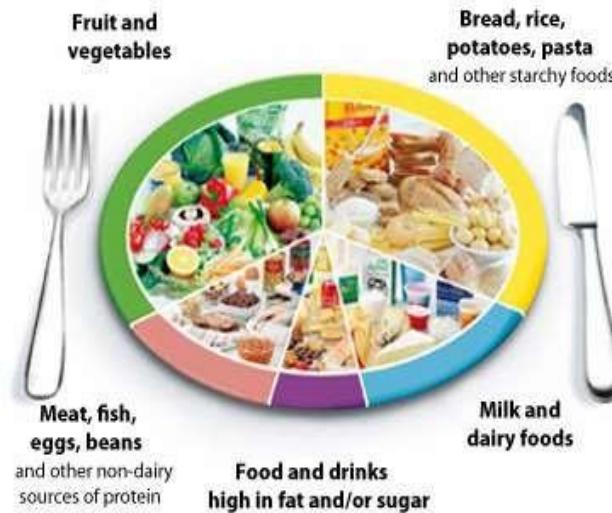
10 steps for coping with a chronic condition

- Get a prescription for information.
- Make your doctor a partner in care.
- Build a team.
- Coordinate your care.
- Make a healthy investment in yourself.
- Make it a family affair.
- Manage your medications.
- Beware of depression.

Prevent Chronic Diseases----contd....

- **Eat Healthy.** Eating healthy helps prevent, delay, and manage heart disease, type 2 diabetes, and other chronic diseases.
- **Get Regular Physical Activity.** Regular physical activity can help you prevent, delay, or manage chronic diseases.
- **Avoid Alcohol.**
- **Get Screened.**
- **Get Enough Sleep.**





Prevent Chronic Diseases----contd....

Vaccines and immunisation

- Diseases can be now prevented- vaccines and immunisation
- A **vaccine** is a biological preparation that provides active acquired immunity to a particular infectious disease.
- **Vaccines** - eradicate smallpox, polio, diphtheria, pneumonia and tetanus
- Through Biotechnology we can make available newer and safer vaccines.
- Discovery of antibiotics and various other drugs has also enabled us to effectively treat infectious diseases

Immunity

- The foreign agents could be pathogens or any foreign substance that could cause disease in host
- The overall ability of host to fight against disease causing organism-**Immunity**

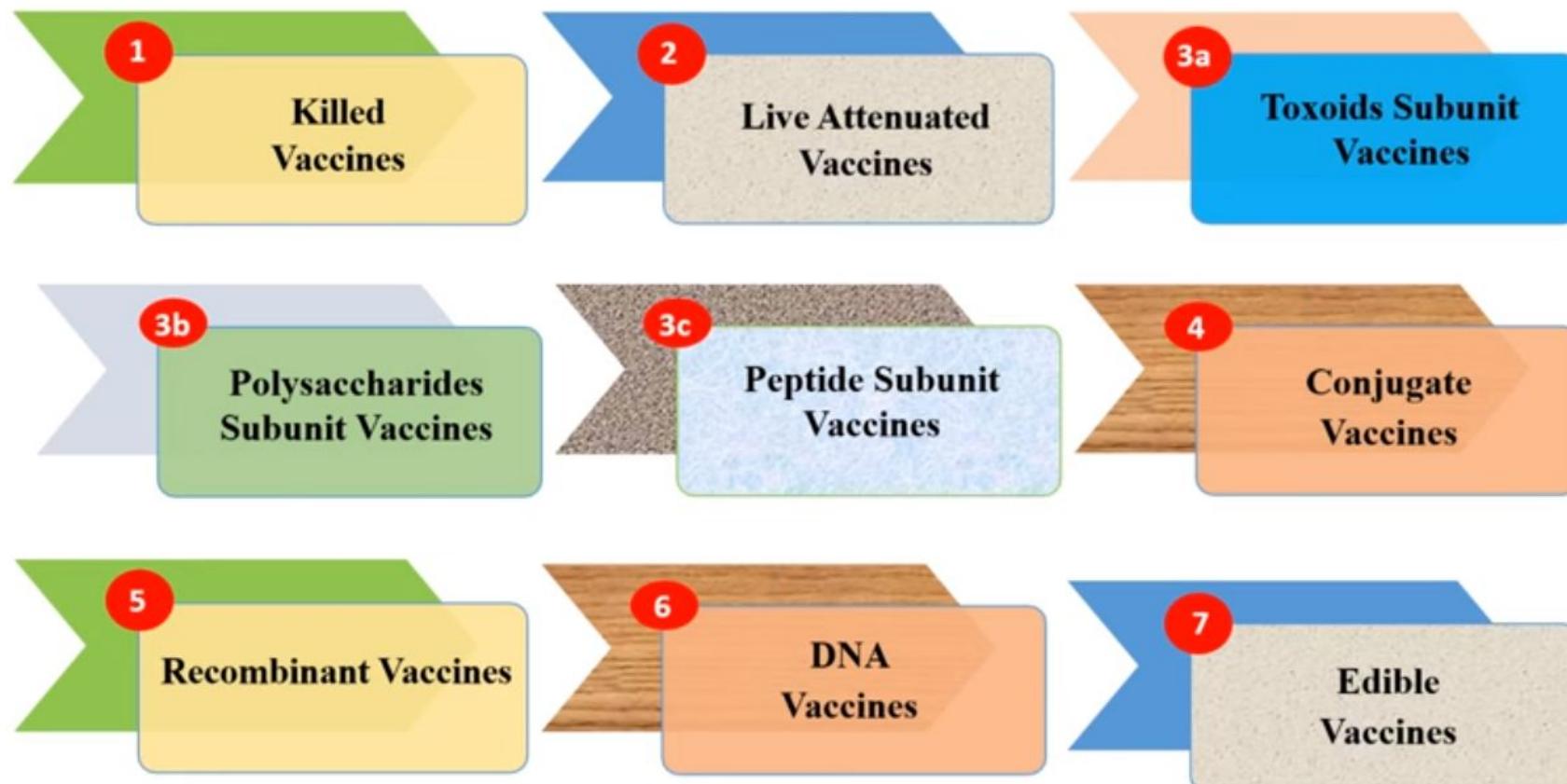
Types of Immunity

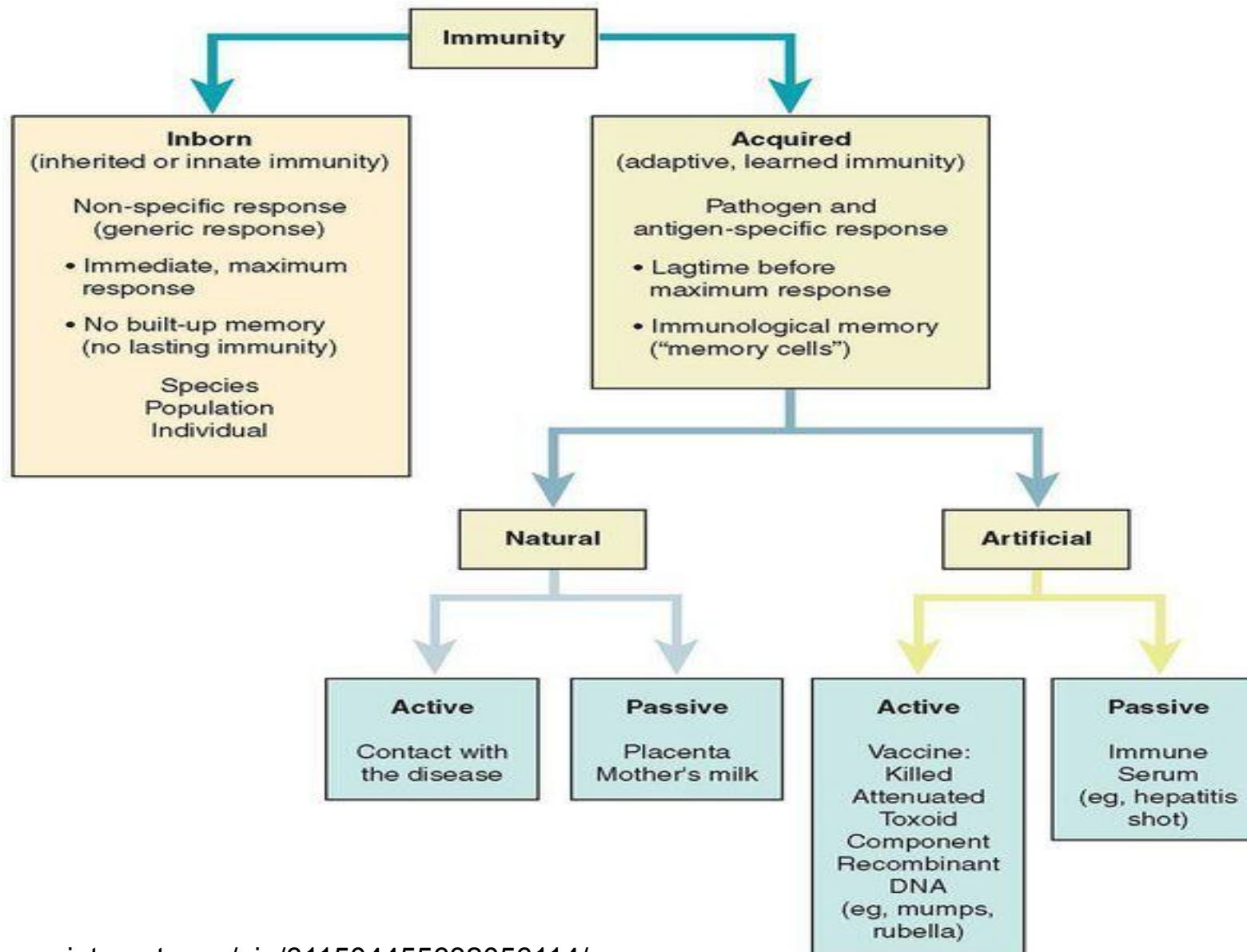
1. **Innate Immunity**
2. **Acquired Immunity**

- **Innate Immunity**- which is present from the time of birth & is not pathogen specific
- **Acquired Immunity**- not from time of birth & is pathogen specific; Immunity is conferred based on memory that immune system have for that pathogen



TYPES OF VACCINES





Principle- “property of ‘memory’ of the immune system”

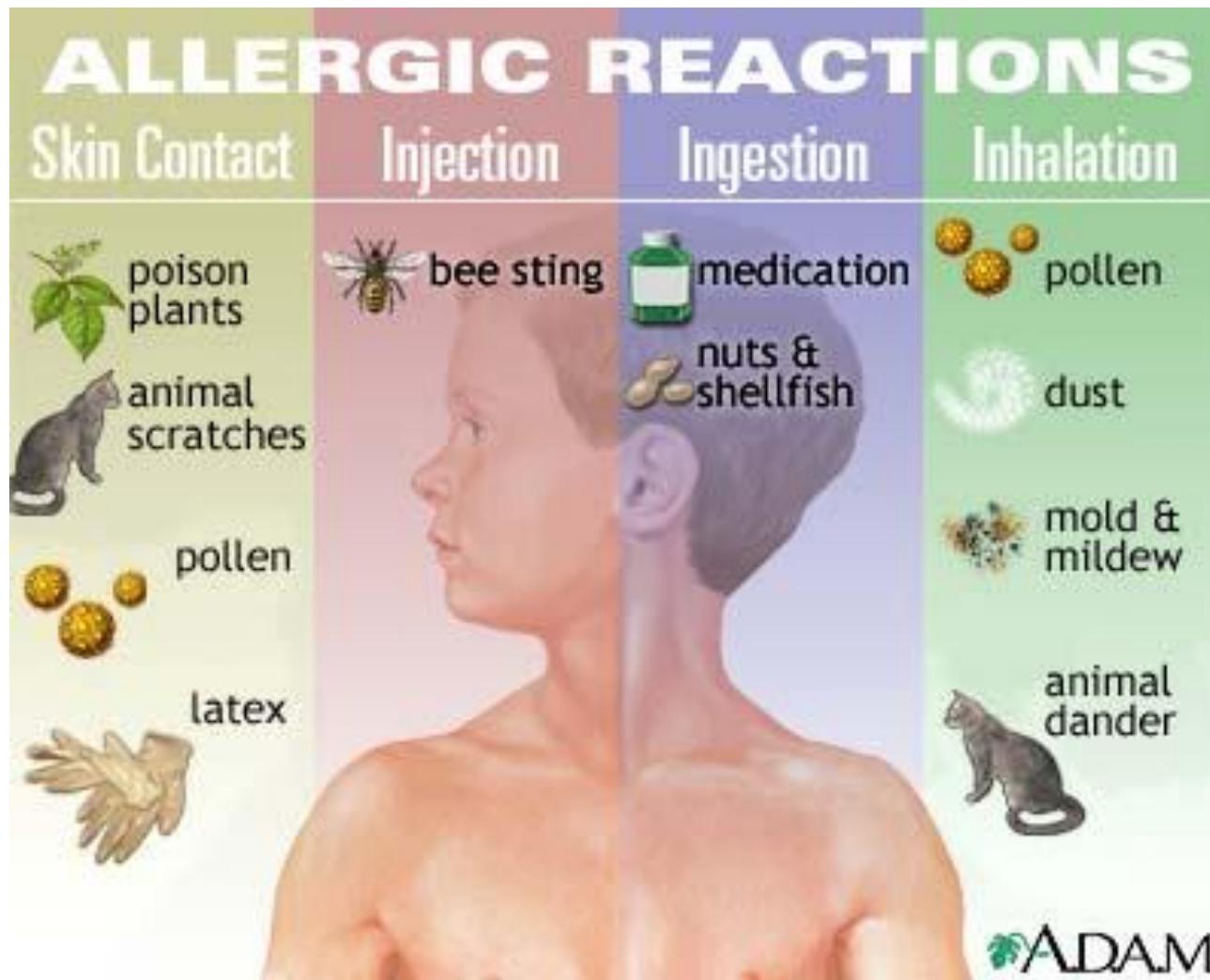
Vaccination

- **Antigenic proteins** of pathogen or **activated/weakened pathogen** (vaccine) are introduced into the body.
- The antibodies produced in the body against these antigens would neutralise the pathogenic agents during actual infection.
- The vaccines also generate memory – B and T-cells that recognize the pathogen quickly on subsequent exposure and overwhelm the invaders with a massive production of antibodies.
- Recombinant DNA technology- antigenic polypeptides of pathogen are produced in bacteria or yeast.
- Vaccines produced using this approach allow large scale production and hence greater availability for immunisation, e.g., hepatitis B vaccine produced from yeast

- Immunization is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine. Vaccines stimulate the body's own immune system to protect the person against subsequent infection or disease.
- Two Types:
 1. **Active Immunisation-** Slow immune response- infected from mild dosage of dead / pretreated live microbe. Eg.- Measles, Mumps, Rubella etc.
 2. **Passive Immunisation-** Quick immune response
 - Direct injection of preformed antibodies (Eg. Tetanus), or antitoxin- a preparation containing antibodies to the toxin (Eg. Snakebites)
 - Snakebites, the injection which is given to the patients, contain preformed antibodies against the snake venom- Passive Immunisation

Allergy: Is hypersensitivity disorder of immune system in which exaggerated response of the immune takes place to certain antigens present in the environment

- Substance which induce allergy- **Allergen** (mites in dust, pollens, animal dander)
- Antibodies produced- IgE type etc.
- Symptoms: Sneezing, watery eyes, running nose and difficulty in breathing.
- Reason: Release of chemicals like **histamine** and **serotonin** from the mast cells
- Diagnosis: Injecting small dosage of possible allergens & reactions are observed
- Drugs **anti-histamine, adrenalin and steroids**- quickly reduce the symptoms of allergy
- Protected environment- lowered immunity thus more & more people are now sensitive to allergens

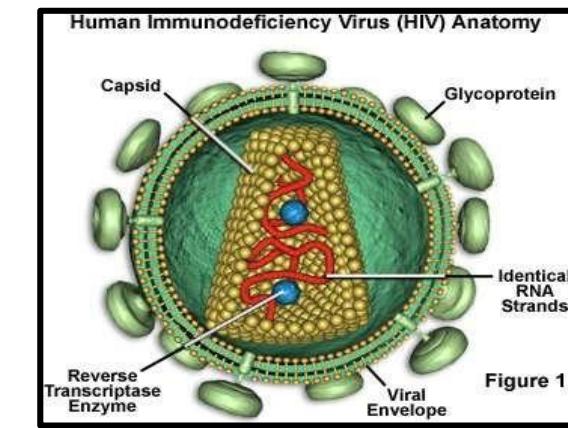


Acquired Immuno Deficiency Syndrome

- **Acquired Immuno Deficiency Syndrome-** disease caused due to deficiency of immune system
- Disease/ syndrome- acquired during the lifetime of an individual indicating that it is not a congenital disease
- First reported in 1981 & last twenty-five years- 25 million persons were killed

Causative organism:-

- **Human Immuno deficiency Virus (HIV)- retrovirus**, i.e RNA virus having RNA genome enclosed by protein coat



Modes of Transmission of HIV infection:

- (a) sexual contact with infected person
 - (b) by transfusion of contaminated blood and blood products
 - (c) by sharing infected needles as in the case of intravenous drug abusers
 - (d) from infected mother to her child through placenta
-
- Individuals with multiple sexual partners, drug addicts who take drugs intravenously, individuals who require repeated blood transfusions and children born to an HIV infected mother- high chance of AIDS

It takes few months to few years (5- 10 years)- between infection & appearance of AIDS symptoms

Symptoms:

- HIV attacks Helper T lymphocyte- reduction of Helper T lymphocyte which cause severe **Cellular immuno- deficiency**
- Bouts of fever, Diarrhoea & Weight loss
- Highly susceptible to *Mycobacterium*, viruses, fungi, parasites like *Toxoplasma*
- Infected person becomes opportunistic to infections

Diagnosis & Treatment:

- Diagnostic test for AIDS- **enzyme linked immuno-sorbent assay(ELISA)**
- Treatment of AIDS with **anti-retroviral drugs**- partially effective
- Drugs can only prolong the life of the patient but cannot prevent death, which is inevitable.

Prevention of AIDS:

- Educating people to generate awareness among them
- National AIDS Control Organization (NACO) and
 - other non-governmental organization (NGOs)
- WHO has started a number of programs to prevent the spreading of HIV infection which includes- Making blood (from blood banks) safe from HIV, ensuring the use of only disposable needles and syringes in public and private hospitals and clinics, free distribution of condoms, controlling drug abuse, advocating safe sex and promoting regular check-ups for HIV in susceptible populations
- Infection with HIV or having AIDS is something that should not be hidden – since then, the infection may spread to many more people

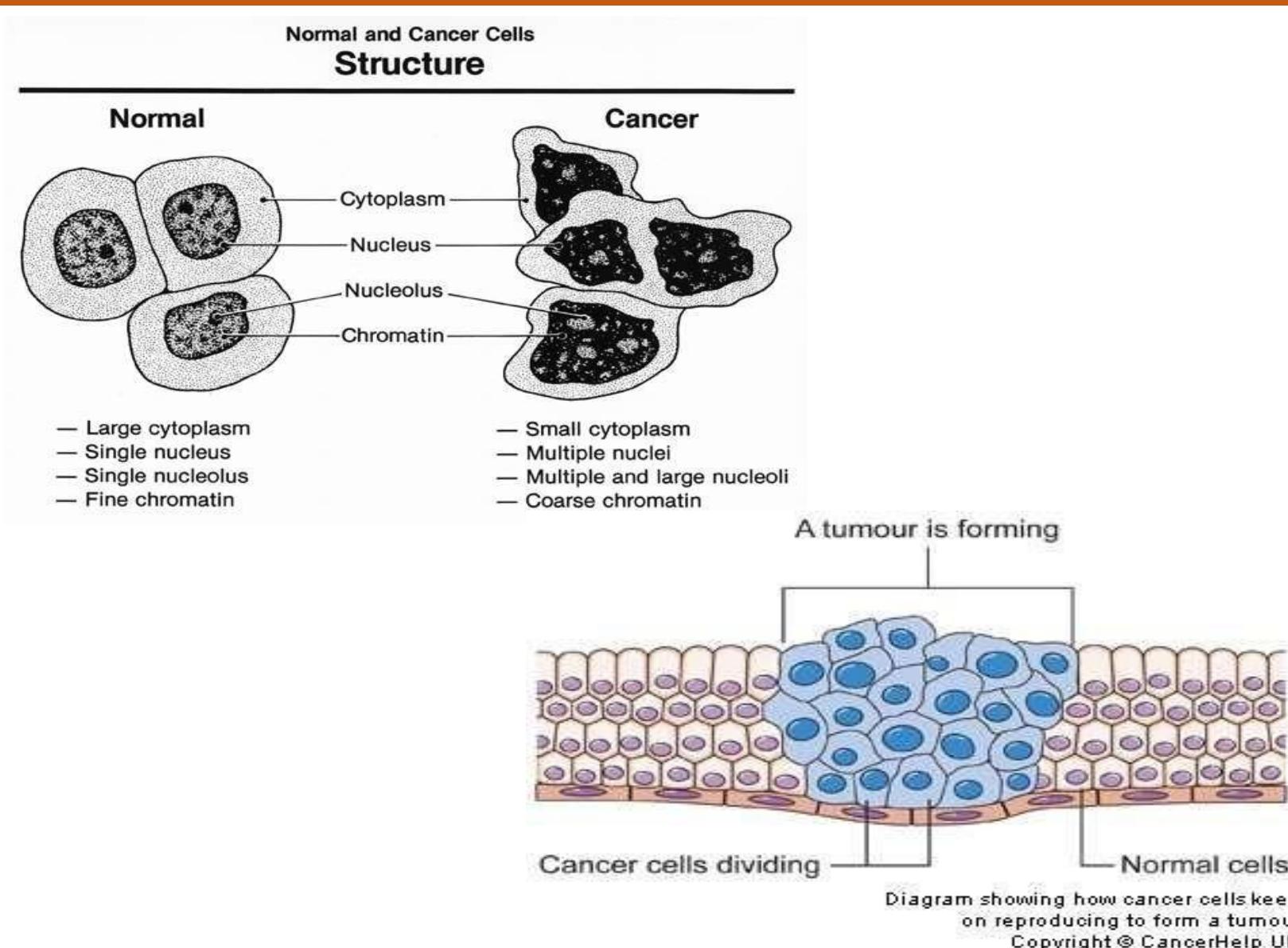
Cancer

- Cancer also known as a malignant tumor, is a group of diseases involving abnormal **cell growth** with the potential to invade or spread to other parts of the body
- Considered as one major cause of death all over world
- Due to its severity process of Oncogenic transformation of cells, its treatment and control requires most intense areas of research in biology and medicine
- Cancer can be induced by external factors- **Carcinogens**

Causes of Cancer:

Normal cells transformed into cancerous neoplastic cells by physical, chemical and biological agents. These agents are called **carcinogen**.

- **Physical agents:** ionizing radiation like X-rays, gamma rays non- ionizing radiations like UV-rays.
- **Chemical agents:** Tobacco smoke, sodium azaide, Methyl ethane sulphonate.
- **Biological agents:**
 - Cancer causing viruses called **oncogenic viruses** have a gene called **viral oncogenes**, induce transformation of neoplastic cells.
 - **Cellular oncogenes** (c-onc) or **proto oncogenes** in normal cells, when activated lead to oncogenic transformation of the normal cells



Mechanism to transformation to cancerous cell:

- Cell growth and differentiation is highly controlled and regulated which is lacked in cancerous cell
- Normal cell show a property- **Contact inhibition**- inhibits uncontrolled growth
- Cancer cells appears to have lost this property. As a result of this, cancerous cells just continue to divide giving rise to masses of cells called **tumors**.

TYPES OF TUMOR

Benign tumors:

- Normally remain confined to their original location
- Do not spread to other location.
- Cause little damage



Malignant tumors:

- Mass of proliferating cells called **neoplastic** or tumor cells.
- These cells grow very rapidly.
- Invade and damage surrounding tissues.
- These cells actively divide and grow; they also starve the normal cells.
- Cancerous cells escape from the site of origin and moves to distant place by blood, wherever they get lodged make the normal cell cancerous. This property is called **metastasis**.

Four main types of cancer are:

Carcinomas. A carcinoma begins in the skin or the tissue that covers the surface of internal organs and glands.

Sarcomas. A sarcoma begins in the tissues that support and connect the body.

Leukemias. Leukemia is a cancer of the blood.

Lymphomas and **Myelomas**, Cancer of immune system

Detection of Cancer:

Biopsy and histopathological study-

- a)tissue and blood and bone marrow tests for increased cell counts (leukemias);
- b)Biopsy of a piece of the suspected tissue cut into thin sections is stained and examined under microscope (histopathological studies) by a pathologist

Radiography like X-rays, CT (computerized tomography)

- a)used to detect cancers of the internal organs
- b)Computed tomography uses X-rays to generate a three- dimensional image of the internals of an object

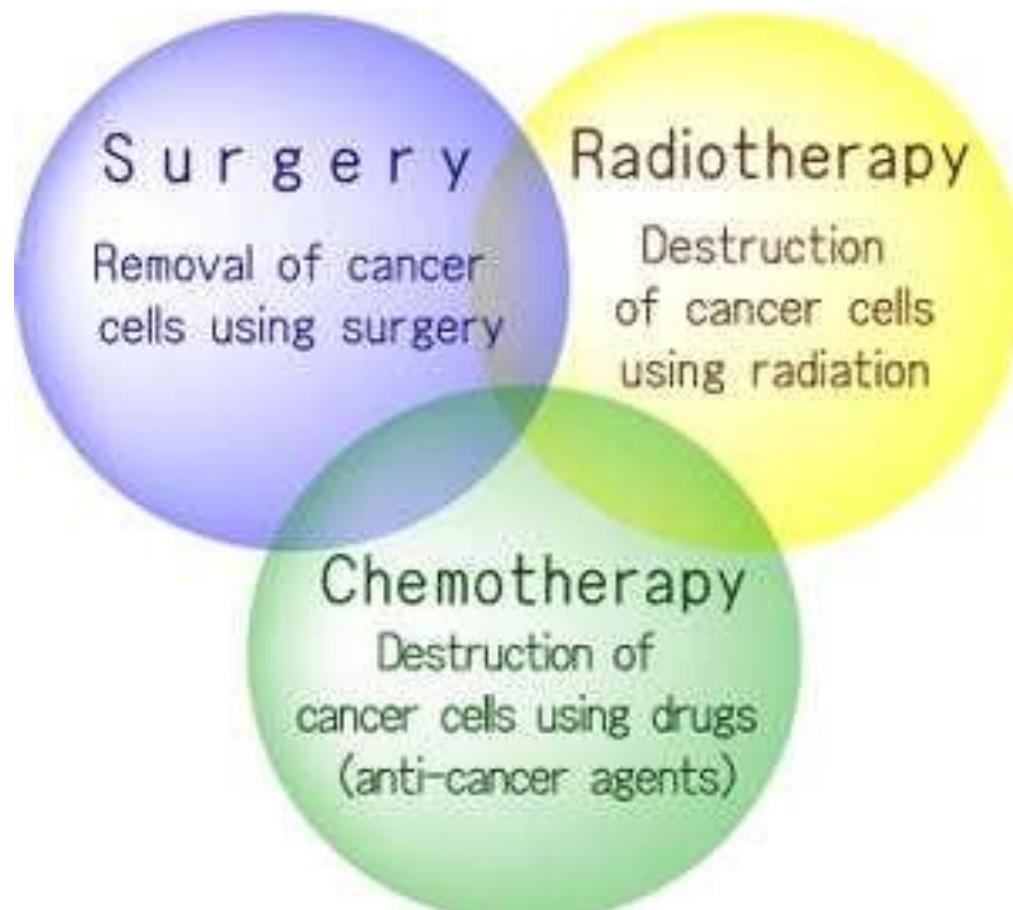
MRI (magnetic resonance Imaging):

- a)uses strong magnetic fields and non-ionising radiations to accurately detect pathological and physiological changes in the living tissue

Antibodies against cancer-specific antigen:

- a) Antibodies against cancer-specific antigens are used for detection of certain cancers genes- person is advised to prevent exposure

Treatment



Pandemic Management Platform



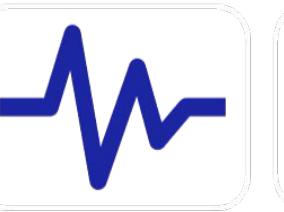
Contact Tracing
Command Center
Automation



Location History
Management



Risk Assessment for
Individual



Health Assessment
Screening Bot



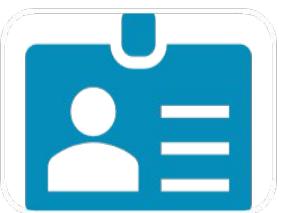
QnA Bot



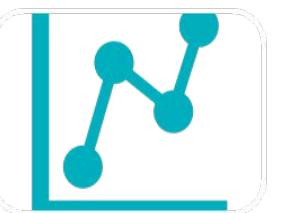
Mass Surveillance
Over Edge



Quarantine
Enforcement



E-Pass Verification
API



Pandemic Analytical
Models



THANK YOU

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Introduction to Telemedicine

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TELEMEDICINE

World Health Organization defines telemedicine as

‘The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities.’

TELEHEALTH

‘The delivery and facilitation of health and health-related services including medical care, provider and patient education, health information services, and self-care via telecommunications and digital communication technologies.’

Who can be associated with Telemedicine system ?

REGISTERED MEDICAL PRACTITIONER

'A Registered Medical Practitioner [RMP] is a person who is enrolled in the State Medical Register or the Indian Medical Register under the Indian Medical Council Act 1956.' [IMC Act, 1956].

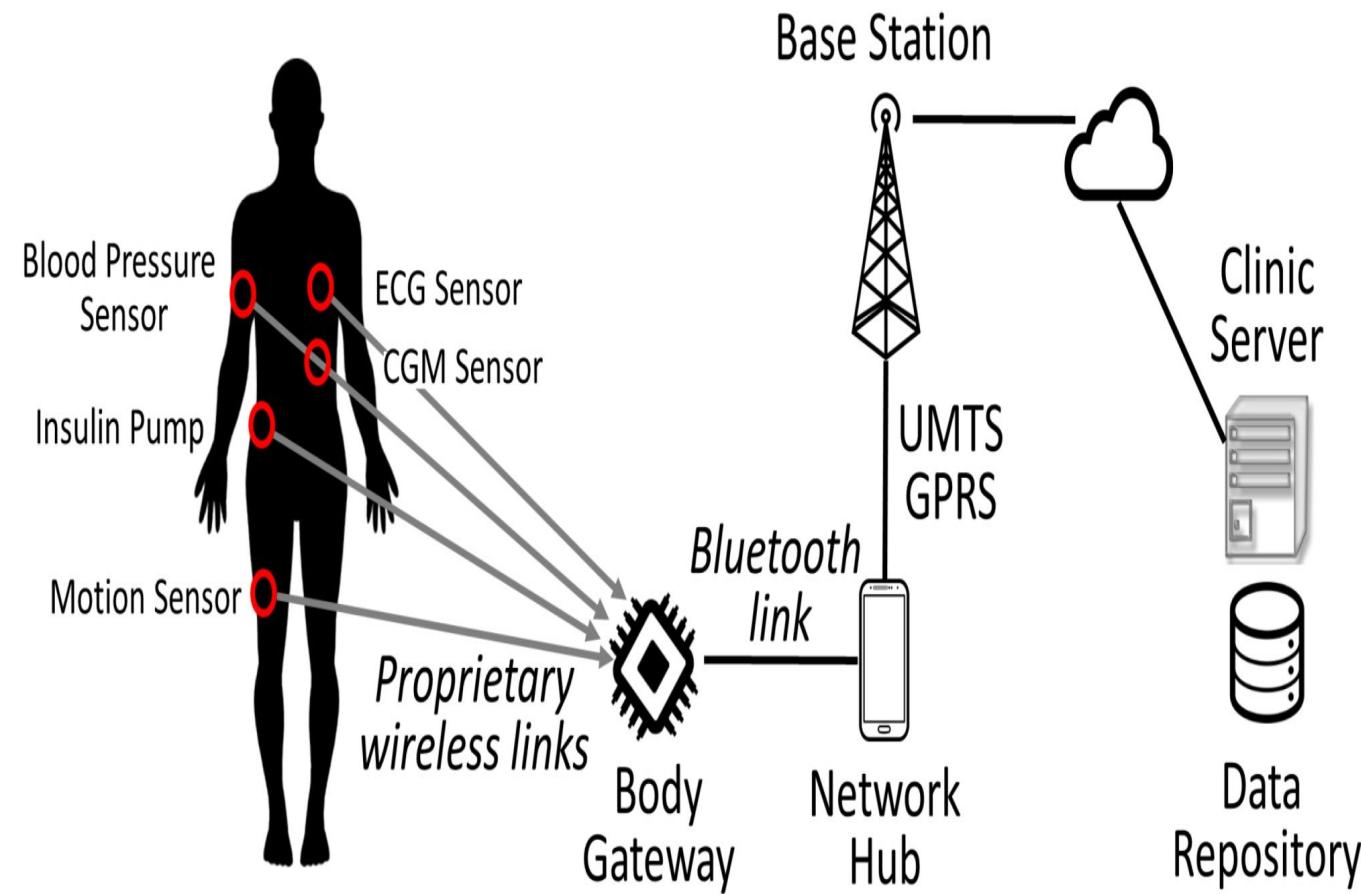
- Patient management approach combining various information technologies for monitoring patients at distance.
- Information technology application domains in health care include telemedicine and home telecare.

- Chronic health conditions such as *pulmonary conditions, diabetes, hypertension, and cardiovascular diseases, which are preventable or highly treatable.*
- These individuals account for the vast majority of all healthcare spending — funds that could be saved with better preventative care and disease management .
- *Telepsychiatry, teleradiology, teledermatology, and teleophthalmology.*
- Provides specialist consultation to distant communities, *rather than to provide a tool for self-management of chronic disease.*

- Home telecare- focused on providing care in a home setting with the primary intent of supporting the patient rather than the health professionals.
- Home telemonitoring is used in a more restrictive sense and encompasses the use of audio, video, and other telecommunication technologies to monitor patient status at a distance

Tools for Telemedicine

Telephone, video, devices connected over LAN, WAN, Internet, mobile or landline phones, Chat Platforms like WhatsApp, Facebook Messenger etc., or Mobile App or internet based digital platforms for telemedicine or data transmission systems like Skype/ email/ fax etc.

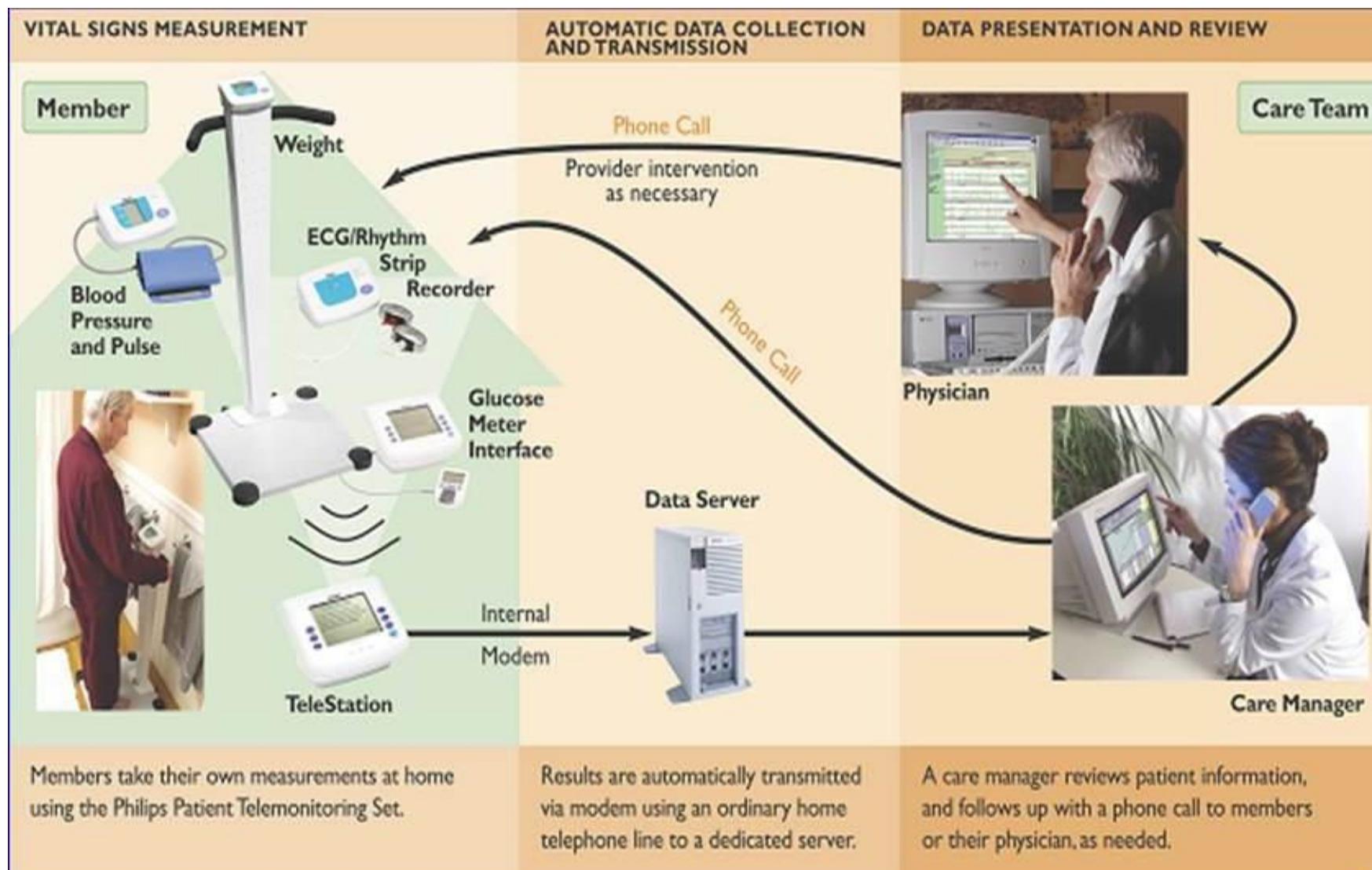


Telemedicine applications can be classified into four basic types

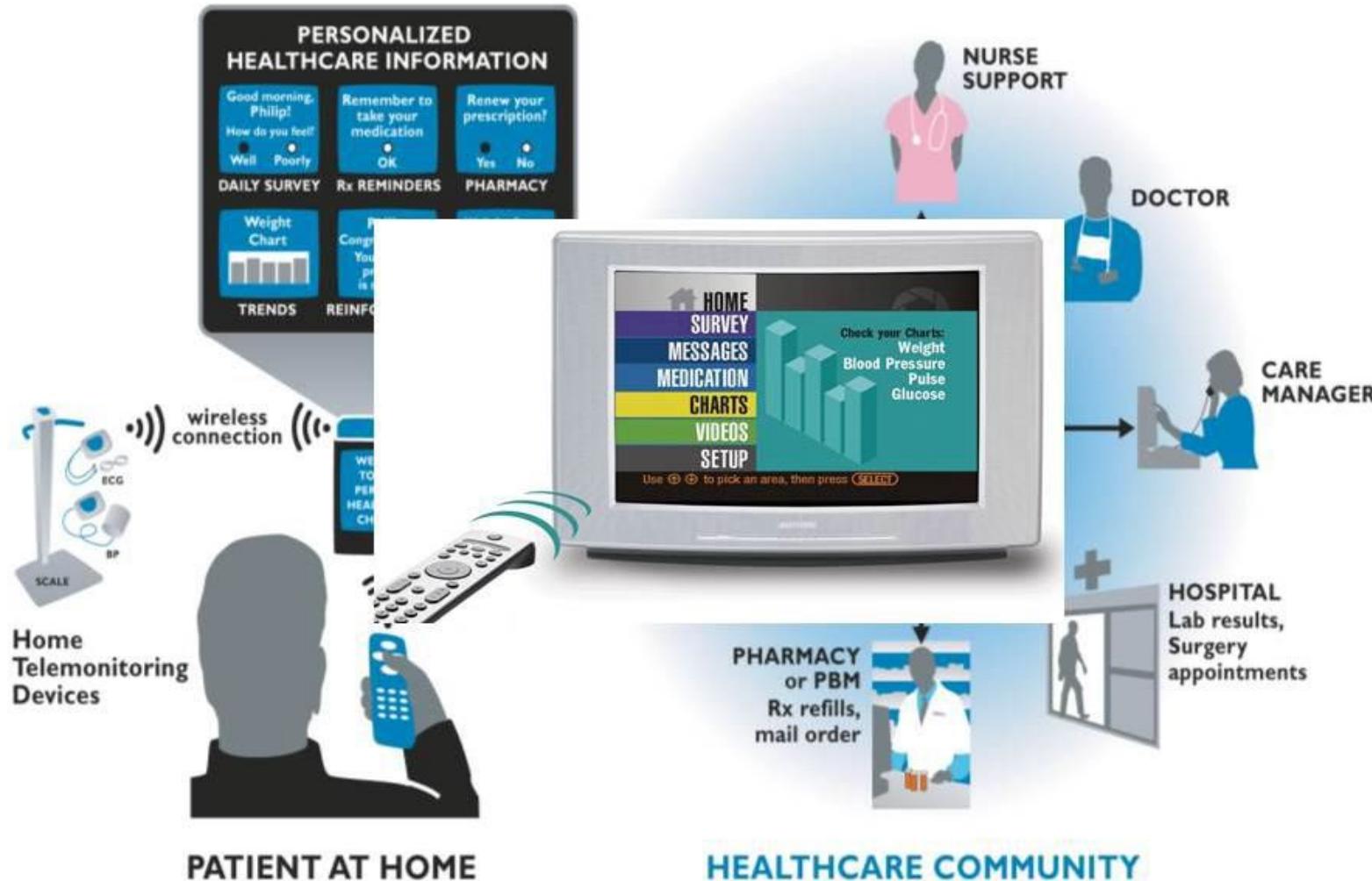
- 1.mode of communication
- 2.timing of the information transmitted
- 3.the purpose of the consultation and
- 4.the interaction between the individuals involved—be it RMP-to-patient / caregiver, or RMP to RMP.

ENVIRONMENTAL STUDIES & LIFE SCIENCES

Introduction to Telemedicine



Home monitoring with interactive television



Advantages

- Real-time data
- Decreased hospitalizations
- Actionable alerts
- Early identifications can be reported
- Client satisfaction

Must watch: <https://www.youtube.com/watch?v=H0etieBDxeY>

Disadvantages

- Reducing the number of complications remains inconsistent across chronic illnesses
- Very few have reported resulting changes in medication regimens and quality of life
- Clinical effects reported in several cardiac studies were often minimal and inconclusive

Telemedicine in Karnataka

- Karnataka introduced the Telemedicine Network Project in 2001 and the project was initiated by the Indian Space Research Organisation (ISRO).
- The first phase of the project was rolled out in the district hospitals of Mandya, Chitradurga, Chamarajnagar, Tumkur, Chikmagalur, Karwar, Shimoga, and Gadag.
- At the taluk level, hospitals offering telemedicine services during the first phase were Sagara, Maddur, and Yadgir.
- Expert medical advice was given by specialists from St. John's Medical College and Hospital, NIMHANS, Jayadeva Institute of Cardiology, Narayana Hrudayalaya, in Bangalore while from Mysore, it was JSS hospital that offered the service.

- The telemedicine project in Karnataka is coordinated by the Karnataka State Remote Sensing Applications Centre (KSRSAC) which uses the Indian Remote Sensing Satellite for monitoring and managing resources.
- Under the telemedicine project, hospitals in remote locations are connected to super-speciality hospitals from major cities via INSAT satellites thereby establishing a link between the patients and the specialised medical experts.
- The telemedicine system is a customised software that is integrated with the computer hardware and diagnostic instruments which in turn is joined to the Very Small Aperture Terminal (VSAT) at every location.



THANK YOU

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ENVIRONMENTAL STUDIES & LIFE SCIENCES

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Artificial intelligence in Diagnosis

Applications

Challenges

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Disease Management and IPR - AI in Diagnosis

Artificial intelligence (AI) - an interdisciplinary science

- AI is a wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence.
- It is widely accepted that the term AI was first coined in 1956 when American computer scientist John McCarthy *et al.* organized the Dartmouth Conference.
- Prior to that, work in the field of AI included the Turing test proposed by Alan Turing as a measure of machine intelligence and a chess-playing program written by Dietrich Prinz.

Disease Management and IPR - AI in Diagnosis

Artificial intelligence (AI) in Diagnosis

- Healthcare is shaping up in front of our eyes with advances in digital healthcare technologies such as artificial intelligence (AI), 3D printing, robotics, nanotechnology, etc.
- Digitized healthcare presents numerous opportunities for reducing human errors, improving clinical outcomes, tracking data over time, etc.
- AI methods from machine learning to deep learning assume a crucial function in numerous well-being-related domains, including improving new clinical systems, patient information and records, and treating various illnesses



“Artificial intelligence (AI) is a multidisciplinary field of computer science that deals with the creation of systems, algorithms, and software capable of simulating human intelligence...”
”

Source: Kumar et al., Artificial intelligence in disease diagnosis: a systematic literature review, synthesizing framework and future research agenda. *J Ambient Intell Humaniz Comput.* 2023;14(7):8459-8486.

Image source: <https://www.impactqa.com/blog/artificial-intelligence-ai-and-its-assistance-in-medical-diagnosis/>

Image source: <https://www.revechat.com/blog/what-is-ai/>

Disease Management and IPR - AI in Diagnosis

Artificial intelligence (AI) in Diagnosis

- The AI techniques are also most efficient in identifying the diagnosis of different types of diseases.
- The presence of computerized reasoning (AI) as a method for improved medical services offers unprecedented occasions to recuperate patient and clinical group results, decrease costs, etc.
- The models used are not limited to computerization, such as providing patients, “family”, and medical service experts for data creation and suggestions as well as disclosure of data for shared evaluation building.
- AI can also help to recognize the precise demographics or environmental areas where the frequency of illness or high-risk behaviors exists.



Source: Kumar et al., Artificial intelligence in disease diagnosis: a systematic literature review, synthesizing framework and future research agenda. *J Ambient Intell Humaniz Comput.* 2023;14(7):8459-8486.

Image source: <https://www.theengineer.co.uk/content/in-depth/how-ai-is-powering-a-revolution-in-medical-diagnostics/>

Disease Management and IPR - AI in Diagnosis

Artificial intelligence (AI) in Diagnosis

- Artificial intelligent systems in healthcare have the following typical pattern.
- Such a system starts with a large amount of data, on these data machine-learning algorithms are employed to gain information, this information is then used to generate a useful output to solve a well-defined problem in the medical system.

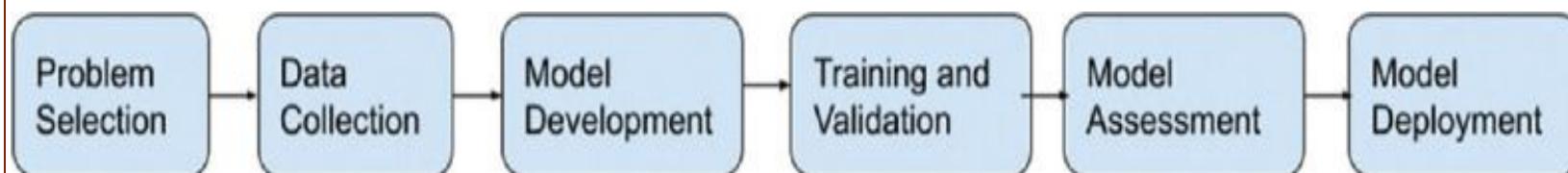


Illustration outlining the development of an artificially intelligent model

Disease Management and IPR - AI in Diagnosis

Applications of AI in diagnosis / biomedical engineering

- The integration of AI in medicine is revolutionizing healthcare by enhancing diagnostic accuracy, personalizing treatment, and improving patient outcomes.
- As technology advances, the potential for AI to transform various aspects of healthcare continues to grow, promising a future of improved efficiency, accessibility, and quality of care.
- This paradigm shift requires collaboration between technologists, healthcare professionals, and policymakers to address ethical concerns and ensure that AI benefits all stakeholders involved.
- Ongoing collaboration among engineers, clinicians, & researchers is essential to address challenges and maximize the benefits of AI technologies in biomedical applications.

Disease Management and IPR - AI in Diagnosis

Applications of AI in diagnosis / biomedical engineering

1. Medical Imaging

- **Image Analysis:** AI algorithms enhance the accuracy of image interpretation (e.g., X-rays, MRIs, CT scans) by identifying abnormalities such as tumors, fractures, or lesions.
- **Early Detection:** AI systems can detect diseases like cancer at earlier stages, improving prognosis and treatment outcomes.
- **Radiomics:** AI extracts large amounts of features from medical images that may not be visible to the human eye, aiding in more personalized treatment strategies.

2. Predictive Analytics

- **Risk Assessment:** AI tools analyze patient data to predict the likelihood of developing conditions like diabetes, heart disease, or sepsis.
- **Outcome Prediction:** Machine learning models can forecast patient outcomes, helping clinicians make informed decisions about treatment plans.

Disease Management and IPR - AI in Diagnosis

Applications of AI in diagnosis / biomedical engineering

3. Personalized Medicine

- **Genomic Data Analysis:** AI processes vast amounts of genetic information to identify mutations linked to specific diseases, leading to targeted therapies.
- **Tailored Treatment Plans:** By analyzing patient-specific data, AI helps devise individualized treatment strategies based on genetics, lifestyle, and environmental factors.

4. Drug Discovery and Development

- **Molecular Screening:** AI accelerates drug discovery by predicting how different compounds will interact with biological targets, reducing the time and cost involved.
- **Clinical Trial Optimization:** AI identifies suitable candidates for clinical trials and can predict patient responses to drugs, enhancing trial efficiency.

Applications of AI in diagnosis / biomedical engineering

5. Clinical Decision Support Systems (CDSS)

- **Evidence-Based Recommendations:** AI systems provide clinicians with evidence-based treatment suggestions, improving decision-making and patient safety.
- **Alerts for Potential Issues:** These systems can flag potential drug interactions, allergies, or deviations from best practices.

6. Robotic Surgery

- **Precision and Control:** AI-powered robotic systems assist surgeons in performing complex procedures with enhanced precision and minimally invasive techniques.
- **Learning from Data:** Robotic systems continuously learn from surgical outcomes to improve performance and technique over time.

Applications of AI in diagnosis / biomedical engineering

7. Telemedicine

- **Virtual Health Assistants:** AI-driven chatbots provide patients with immediate responses to health inquiries, triaging them before they see a healthcare provider.
- **Remote Monitoring:** AI systems analyze data from wearable devices to monitor patient health in real-time, alerting providers to any concerning changes.

8. Natural Language Processing (NLP)

- **Clinical Documentation:** AI helps automate the transcription of clinical notes, making documentation more efficient and reducing administrative burdens.
- **Information Retrieval:** NLP tools can sift through vast medical literature, extracting relevant information for clinicians, aiding in research and patient care.

Applications of AI in diagnosis / biomedical engineering

9. Behavioral Health

- **Mental Health Monitoring:** AI applications can analyze speech patterns and facial expressions to assess mental health status and provide timely interventions.
- **Chatbots for Therapy:** AI chatbots can offer cognitive behavioral therapy (CBT) techniques, providing support for patients outside of traditional therapy sessions.

10. Administrative Workflow Optimization

- **Scheduling and Resource Management:** AI optimizes appointment scheduling and resource allocation, enhancing operational efficiency in healthcare settings.
- **Claims Processing:** AI automates the processing of insurance claims, reducing errors and speeding up reimbursements.

Applications of AI in diagnosis / biomedical engineering

11. Patient Engagement and Education

- **Personalized Health Content:** AI tailors health education materials to individual patient needs, enhancing understanding and compliance.
- **Health Reminders:** Automated systems send reminders for medication adherence, follow-up appointments, and preventive care, improving patient outcomes.

12. Epidemiology and Public Health

- **Disease Outbreak Prediction:** AI analyzes patterns in health data to predict and monitor outbreaks of infectious diseases, aiding public health responses.
- **Population Health Management:** AI identifies high-risk populations, guiding interventions aimed at improving community health outcomes.

Disease Management and IPR - AI in Diagnosis

Applications of AI in diagnosis / biomedical engineering

13. Wearable Health Technologies

- **Continuous Monitoring:** AI processes data from wearables to provide insights into vital signs, activity levels, and overall health, alerting users to potential issues.
- **Lifestyle Recommendations:** Based on user data, AI can suggest personalized lifestyle changes to improve health and prevent disease.

14. Biomedical Signal Processing

- **Noise Reduction:** AI enhances the quality of signals from various biomedical sources (like EEG or ECG) by filtering out noise and artifacts.
- **Pattern Recognition:** AI identifies patterns in biological signals, aiding in the diagnosis of conditions such as epilepsy or cardiac arrhythmias.

Disease Management and IPR - AI in Diagnosis

Applications of AI in diagnosis / biomedical engineering

15. Social Determinants of Health

- **Data Analysis:** AI analyzes social determinants (like socioeconomic status, education, and environment) to better understand their impact on health outcomes.
- **Targeted Interventions:** AI helps design interventions aimed at addressing these determinants, promoting equity in healthcare access and outcomes.

16. Chronic Disease Management

- **Monitoring and Alerts:** AI systems track chronic conditions (like asthma, diabetes, and hypertension), sending alerts for necessary interventions based on real-time data.

Disease Management and IPR - AI in Diagnosis

AI in diagnosis presents several challenges

1. Data Quality and Availability

- **Incomplete Data:** Many healthcare datasets are incomplete or inconsistent, which can lead to inaccurate AI models.
- **Bias in Data:** If training data is not representative of diverse populations, AI systems may perform poorly for underrepresented groups, leading to biased diagnoses.

2. Interpretability and Transparency

- **Black Box Problem:** Many AI models, especially deep learning algorithms, function as "black boxes," making it difficult for clinicians to understand how decisions are made.
- **Trust and Acceptance:** Clinicians may be hesitant to rely on AI recommendations without clear explanations, impacting the adoption of AI tools.

Disease Management and IPR - AI in Diagnosis

AI in diagnosis presents several challenges

3. Integration with Clinical Workflows

- **Compatibility Issues:** Integrating AI tools into existing healthcare systems can be complex and may require significant changes to workflows and infrastructure.
- **User training and Adoption:** Clinicians and staff need training to effectively use AI tools, which can be time-consuming and costly.

4. Regulatory and Ethical Concerns

- **Regulatory Approval:** Navigating the regulatory landscape for AI in healthcare can be challenging, as there are varying standards and requirements across regions.
- **Ethical Considerations:** Issues around patient consent, data privacy, and the potential for AI to replace human decision-making raise ethical questions.

Disease Management and IPR - AI in Diagnosis

AI in diagnosis presents several challenges

5. Reliability and Generalization

- **Overfitting:** AI models trained on specific datasets may not generalize well to new or varied patient populations, leading to unreliable diagnoses in different settings.
- **Performance Variability:** The performance of AI systems can vary based on the quality of input data, making it crucial to validate models in diverse environments.

6. Cost and Resource Allocation

- **Implementation Costs:** Developing, validating, and implementing AI systems can be expensive, posing a barrier for some healthcare organizations.
- **Resource Limitations:** Smaller practices may lack the resources to invest in AI technology, leading to disparities in access to advanced diagnostic tools.

7. Liability and Accountability

- **Legal Responsibility:** Determining liability when AI systems provide incorrect diagnoses can be complex, raising questions about accountability among developers, clinicians, and institutions.

Disease Management and IPR - AI in Diagnosis

Around the world using artificial intelligence in medical sciences

Company	Purpose	Website
AiCure (New York City) Patient-oriented	Uses video, audio, and behavioral data to better understand the connection between patients, disease and treatment.	https://aicure.com
Aidence (Amsterdam, The Netherlands) Clinician-oriented	AI for radiologists: improving diagnostics for the treatment of lung cancer	https://www.aidence.com
Aiva Health (Los Angeles) Administrative and Operational-oriented	The first voice-powered care assistant: connects patients with the correct physician for communication.	https://aivahealth.com
Babylon Health (London) Administrative and Operational-oriented	Uses NLP and AI to create internationally accessible and affordable health system for all.	https://www.babylonhealth.com
Bot MD (Singapore) Clinician-oriented	Bot assistant: answers clinical questions, transcribes dictated case notes and automatically organizes images and files.	https://www.botmd.io/en/
Suki (San Francisco) Clinician-oriented	Voice enabled digital assistant for physicians	https://www.suki.ai
Insitro (San Francisco) Patient-oriented	Uses advanced machine learning with computational genomics to reduce the time and cost associated with drug discovery for patients.	http://insitro.com/

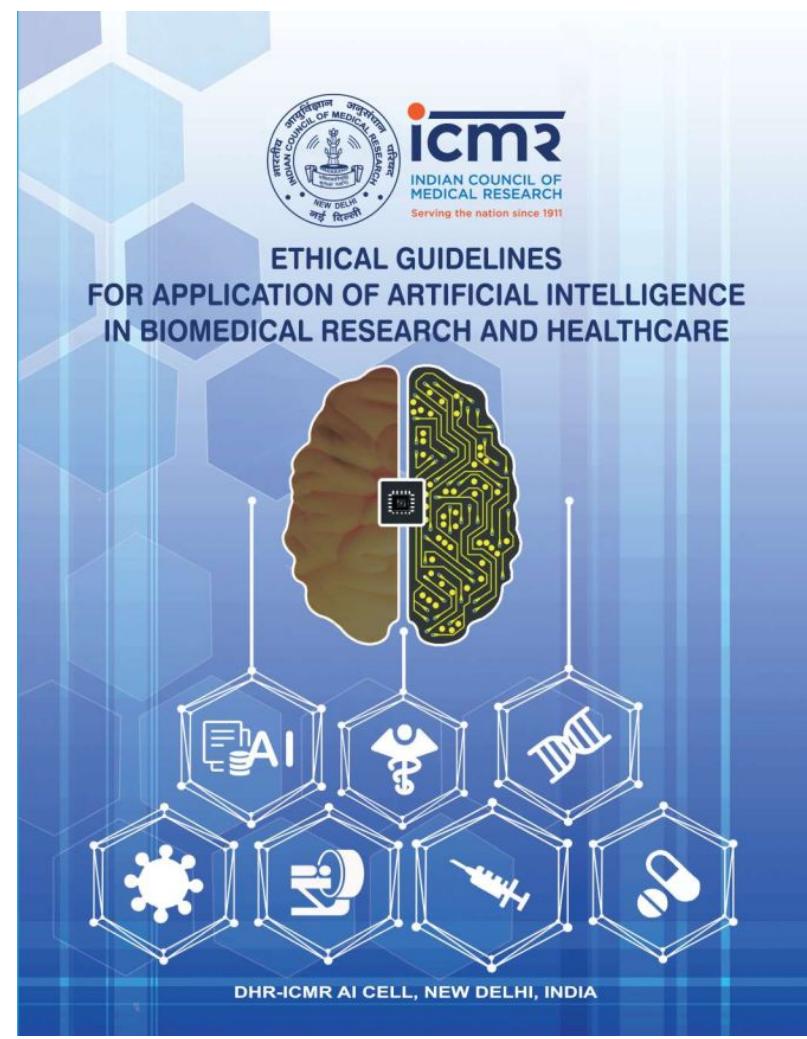
Source: Basu K, Sinha R, Ong A, Basu T. Artificial Intelligence: How is It Changing Medical Sciences and Its Future? Indian J Dermatol. 2020 Sep-Oct;65(5):365-370.

Disease Management and IPR - AI in Diagnosis

Status in India

Scope

These guidelines apply to AI based tools created for all biomedical and health research and applications involving human participants and/or their biological data. Considering the far-reaching implications of AI-based technologies in healthcare, these guidelines are applicable to health professionals, technology developers, researchers, entrepreneurs, hospitals, research institutions, organization(s), and laypersons who want to utilize health data for biomedical research and healthcare delivery using AI technology and techniques.

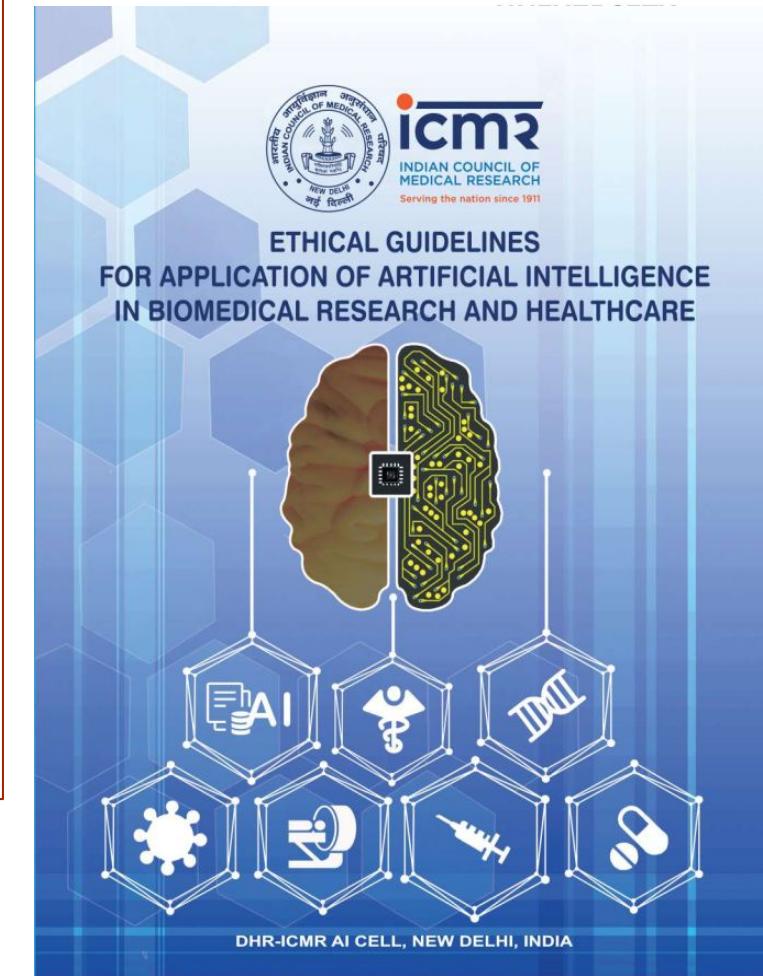


Source: ICMR ethical guidelines for application of AI in Biomedical research & healthcare

Disease Management and IPR - AI in Diagnosis

Status in India - Application of AI in Healthcare

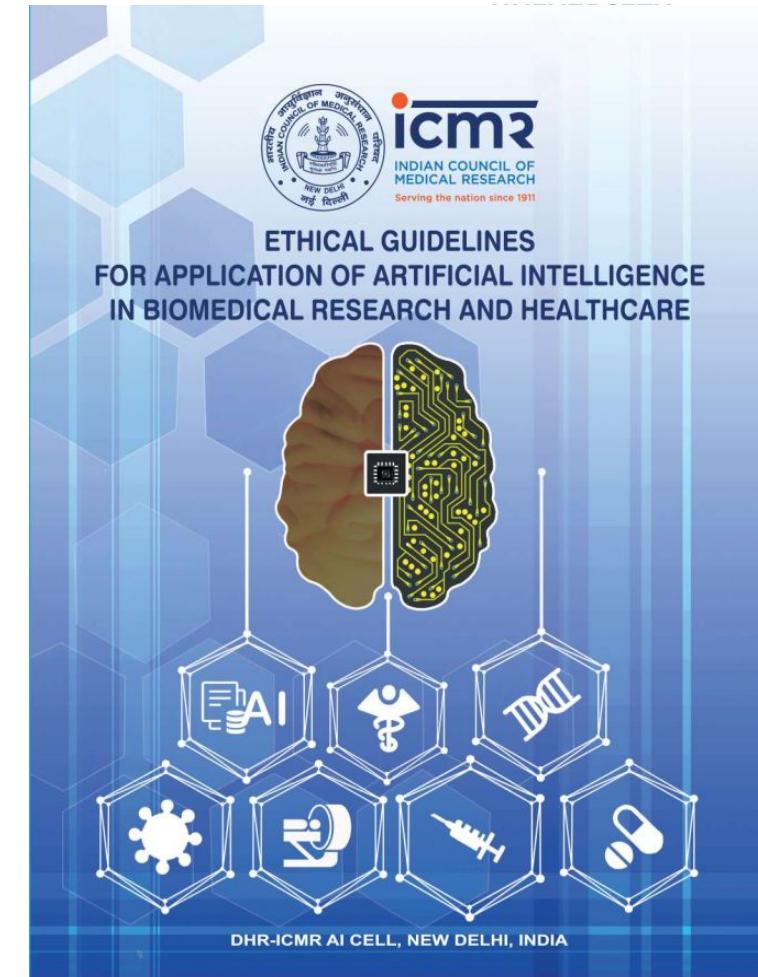
- The induction of AI into healthcare has the potential to be the solution for significant challenges faced in the field of healthcare like diagnosis and screening, therapeutics, preventive treatments, clinical decision making, public health surveillance, complex data analysis, and predicting disease outcomes.
- **Diagnostics and Screening:** AI technologies provides an edge in diagnosing diseases. AI provides the hope to tackle the diagnosis and screening burden on the healthcare system.



Disease Management and IPR - AI in Diagnosis

Status in India - Application of AI in Healthcare

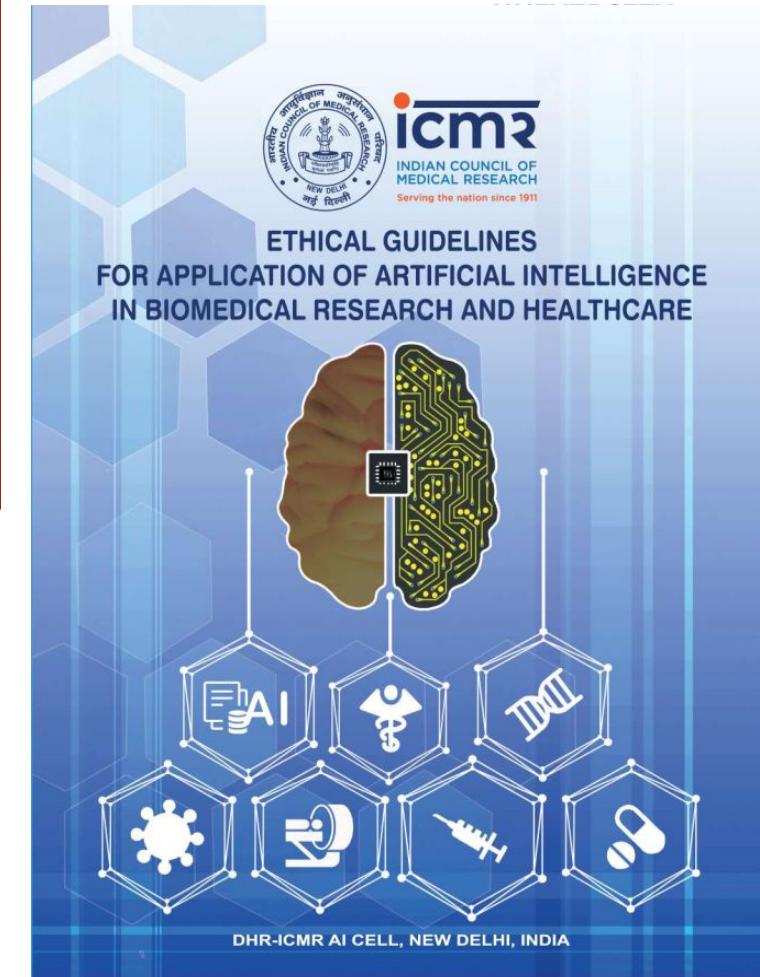
- **Therapeutics, Drug Discovery and Development:** AI technology such as Machine learning (ML) is being used in the field of drug discovery and epitope identification for vaccine development and has the potential to accelerate the process and make it more cost effective.
- Genetic based analysis and personalized drugs to target specific health conditions using AI technology can guide treatment plans.



Disease Management and IPR - AI in Diagnosis

Status in India - Application of AI in Healthcare

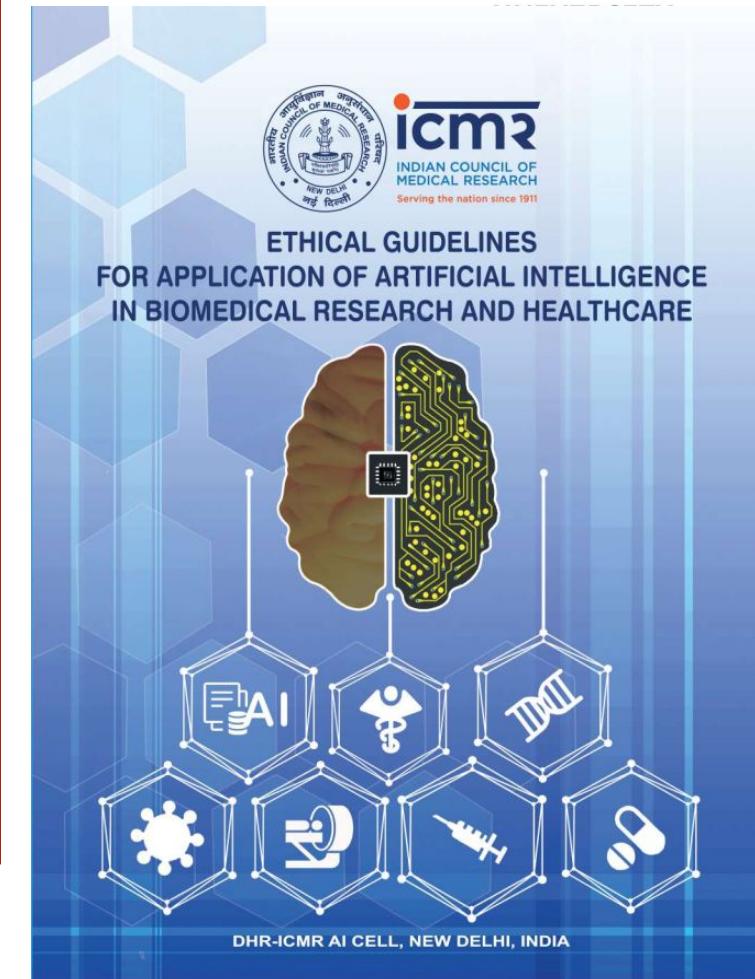
- **Behavioral and Mental Healthcare:** Medical AI model provides significant possibilities in behavioural and mental health treatment.
- Medical AI may improve psychology and psychiatric procedures in a variety of ways, including assisting patients in receiving a diagnosis, actively managing their symptoms between in-person consults, predicting and preventing probable flare-ups, and more.



Disease Management and IPR - AI in Diagnosis

Status in India - Application of AI in Healthcare

- **Health Management Systems using AI:** AI has the potential of improving and optimizing operational functions in a healthcare setup or healthcare organization.
- Healthcare management involves scheduling, admission, Electronic Medical Records (EMR), accounting, billing, claim settling that involves repetitive task and high level of scrutiny.
- By leveraging AI powered tools and automated processes, the productivity could be enhanced, operational and clinical workflows could be improved and operating costs for healthcare practices could be reduced.
- Robotic process automation (RPA) is capable of advanced financial accounting, medical billing and claims. NLP can automate clinical documentation thus reducing the turnaround time.

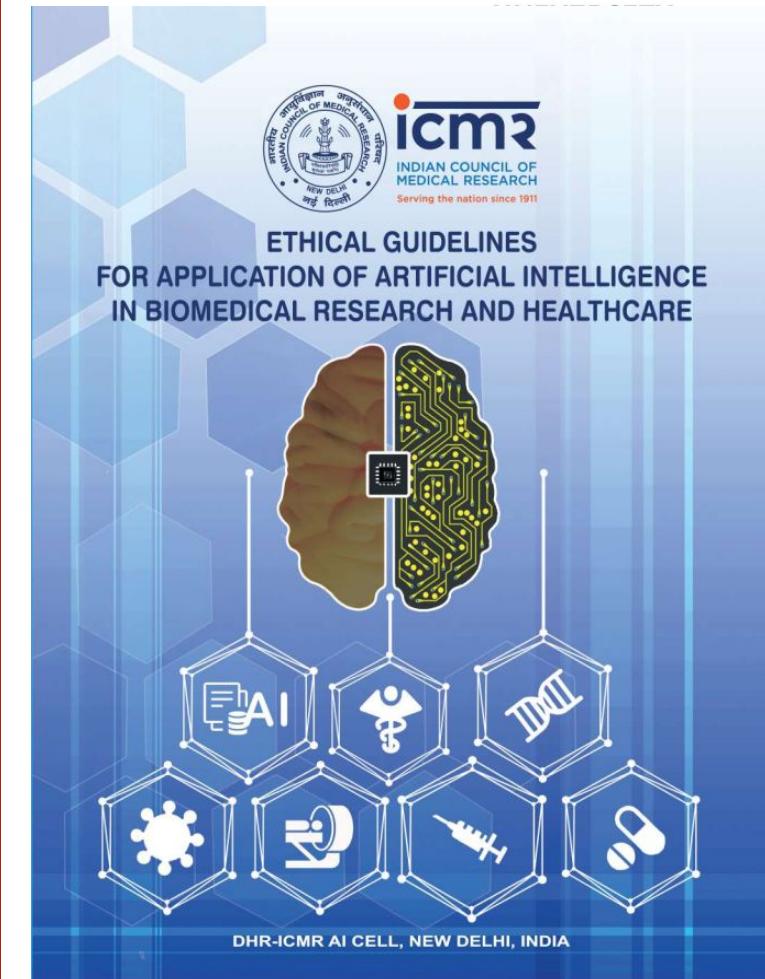


ENVIRONMENTAL STUDIES & LIFE SCIENCES

Disease Management and IPR - AI in Diagnosis



Status in India - Ethical principles in AI for Health



Source: ICMR ethical guidelines for application of AI in Biomedical research & healthcare

Disease Management and IPR - AI in Diagnosis

AI Healthcare tools (Example/s)

- **Merative**, formerly known as IBM Watson Health, can help medical professionals make better decisions, automate daily tasks and empower them to do their most productive work. It is a platform that uses AI in the cloud to store, manage, and analyze medical data in real-time. With the help of this technology, doctors can access patient records more quickly and accurately diagnose patients with a significantly higher level of accuracy.
- **Viz.ai**: With the help of AI, Viz.AI is able to replace outdated, conventional care practices with the use of one convenient platform. This cloud-based patient record management system allows healthcare professionals and patients alike to access and share information more quickly and effectively. When care teams are connected earlier in the workflow with real-time analytics and insights, faster treatment decisions can be made, which leads to better outcomes for the patient.

Disease Management and IPR - AI in Diagnosis

AI Healthcare tools (Example/s)

- **Enlitic** is a healthcare intelligence platform that uses AI to improve the accuracy of health data. Its solutions include Enlitic Curie™, an AI-powered platform designed to enhance patient care through precision diagnosis and clinical decision support. This system can help identify early signs of health conditions, improve treatment decisions, and provide a more accurate view of a patient's overall health.
- **Regard** provide the finest care possible with Regard-a comprehensive intelligent platform that automates tedious clinical tasks, allowing providers more time for their patients. Unlike manual methods of analyzing and synthesizing patient data, this system provides near-instantaneous insights into complete patient pictures without missing any critical information.

Disease Management and IPR - AI in Diagnosis

AI Healthcare tools (Example/s)

Diagnostic Tools

- **Aidoc:** An AI-powered radiology platform that analyzes medical images to detect abnormalities in real-time.
- **Zebra Medical Vision:** Provides AI solutions for analyzing medical imaging data to identify various conditions, including cardiovascular diseases and cancers.
- **PathAI:** Uses deep learning to improve the accuracy of pathology diagnostics by analyzing tissue samples.

Clinical Decision Support

- **IBM Watson Health:** Offers AI-driven insights to assist healthcare providers in clinical decision-making and patient management.
- **Epic Systems:** Integrates AI algorithms into electronic health records (EHRs) to provide clinical decision support and predictive analytics.

Disease Management and IPR - AI in Diagnosis

AI Healthcare tools (Example/s)

Virtual Health Assistants

- **Babylon Health:** An AI-driven health app that provides symptom checking and virtual consultations with healthcare professionals.
- **Ada Health:** A chatbot that helps users understand their symptoms and provides personalized health information.

Drug Discovery and Development

- **Insilico Medicine:** Uses AI to accelerate drug discovery by predicting drug efficacy and identifying potential candidates.
- **Atomwise:** Leverages deep learning to identify new drugs and predict their interactions based on molecular data.

Patient Monitoring and Management

- **Biofourmis:** Provides AI-powered solutions for remote patient monitoring and personalized health management, particularly for chronic diseases.
- **Sensei:** Uses AI to monitor patient vitals and health metrics in real time, providing alerts and insights to healthcare providers.

Disease Management and IPR - AI in Diagnosis

AI Healthcare tools (Example/s)

Population Health and Predictive Analytics

- **Health Catalyst:** Utilizes AI and data analytics to improve healthcare outcomes through predictive modeling and population health management.
- **Qventus:** An AI platform that optimizes hospital operations by predicting patient flow and automating decision-making processes.

Research and Development

- **DeepMind Health:** Focuses on AI research to improve healthcare, particularly in areas like eye disease diagnostics and patient management.
- **Mayo Clinic's AI Platform:** A suite of AI tools designed to enhance research, diagnostics, and patient care.

Disease Management and IPR - AI in Diagnosis

AI Healthcare tools (Example/s)

Imaging and Radiology

- **Lunit**: Develops AI solutions for analyzing medical images, particularly in oncology and chest radiography.
- **RadNet**: An AI-driven platform for radiology that provides insights and automates workflows.

Personalized Medicine

- **Tempus**: Combines clinical and molecular data to provide personalized treatment options for cancer patients through AI analysis.

General Health Platforms

- **CureMetrix**: An AI tool focused on mammography analysis, improving breast cancer detection rates.
- **WellDoc**: An AI-based platform that provides real-time support for managing chronic conditions like diabetes.

ENVIRONMENTAL STUDIES & LIFE SCIENCES

Disease Management and IPR - AI in Diagnosis



AI Solutions For Healthcare

**Powered Diagnostics
and Imaging**

Robotics in Surgery

**Telemedicine and Remote
Patient Monitoring**

**Medical Records
Management**

**Chatbots in
Communication**

**Reduction of Medical
Errors**

**Automated Decision-
Making**

**Early detection and
Diagnosis using AI**



**Making Healthcare
Affordable**

Influencer
MarketingHub

Quick watch:

<https://www.youtube.com/watch?v=H0etieBDxeY>



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ENVIRONMENTAL STUDIES & LIFE SCIENCES

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ENVIRONMENTAL STUDIES & LIFE SCIENCES

Intellectual Property Rights

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- The word **property** is defined in the concise oxford dictionary as something owned, a possession, especially a house, land, etc. and the right to possession, use etc.
- In **Jurisprudence** the term **property** is a very complex term having different aspects which commonly includes all **legal rights, proprietary rights, and corporeal property**.
- Intellectual property means such rights recognized by law which result from **Intellectual creativity or Intellectual activity in the fields of literature, art, science and industry**.

Intellectual process

- Anything someone thinks through the application of his/her mind is collectively known as intellectual process which is the cause of creativity and inventions in this world.

- Intellectual property rights are such rights which are given to persons **who are the authors or creators of the new and original literary and artistic works such as books, articles , other writings ,paintings , musical compositions, sculpture , films and computer programs by application of their creativity process and intellect.**

- WIPO (World Intellectual Property Organization) was established by the WIPO Convention in 1967
- The WIPO is a **specialized agency of** the United Nations.
- It **promote the protection of IP** throughout the world.
- Its headquarters are in Geneva, Switzerland



Types of property:

- Movable Property
 - Car, Pen, Furniture, Dress
- Immovable Property
 - Land, Building
- Intellectual Property
 - Literary works, inventions

IP as a property

- Can be sold
- Can be bought
- Can be lease or rent
- Can pass under a will
- Can be assigned

NECESSITY OF IPR PROTECTION

Intellectual property rights protection is necessary due to following reasons:

- Encouragement to creativity by ensuring its reward
- Innovations in technology
- Protection of users and consumers
- Transfer of technology to less developed nations and countries of the world
- IPR are given to such individuals to compensate for their efforts during such creative process and their investments.
- These rights are given for a certain period of time and after which general public have the right to get freely benefitted and use subsequently.

- Encouragement to creativity by ensuring its reward
- All the creations are used by human beings for their enjoyment and benefit and due to that reason they have social applications in economic and social terms like financial gains and reputation.
- Pirates and imitators are not only depriving the intellectual property right-holders from their legal rights but also looting the users and consumers of such products and goods which are not original or produced by the real producers.

The role of IP as intangible property provides:

- Economic rights of creators
- Commercial exploitation of owner of IP
- Capital expenditure
- Transfer of technology
- Cultural development

TYPES/TOOLS OF IPRs

- Patents.
- Trademarks.
- Copyrights and related rights.
- Geographical Indications.
- Industrial Designs.
- Trade Secrets.
- Layout Design for Integrated Circuits.
- Protection of New Plant Variety.

ENVIRONMENTAL STUDIES & LIFE SCIENCES

Intellectual Property Rights



Patent

The word *patent* originates from the Latin *patere*, which means "to lay open" (i.e., to make available for public inspection).

- A patent is an exclusive right granted for an invention, which is a product or a process that provides a new way of doing something, or offers a new technical solution to a problem.
- It provides protection for the invention to the owner of the patent.
- The protection is granted for a limited period, i.e., 20 years.
- Patent protection means that the invention cannot be commercially made, used, distributed or sold without the patent owner's consent.
- In principle, the patent owner has the exclusive right to prevent or stop others from commercially exploiting the patented invention.

Patent

- Patents are territorial rights. In general, the exclusive rights are only applicable in the country or region in which a patent has been filed and granted, in accordance with the law of that country or region.

What kinds of inventions can be protected?

- Patents may be granted for inventions in any field of technology, from an everyday kitchen utensil to a nanotechnology chip.
- An invention can be a product – such as a chemical compound, or a process, for example – or a process for producing a specific chemical compound.
- Many products in fact contain a number of inventions. For example, a laptop computer can involve hundreds of inventions, working together.

ENVIRONMENTAL STUDIES & LIFE SCIENCES

Intellectual Property Rights



PRODUCTS INVOLVED IN THE TRIAL:

- iPhone 3G
- iPhone 3GS
- iPhone 4** →
- iPad 2 3G
- iPod Touch

Photos: El Tiempo/Zuma Press (Galaxy S); Apple (iPhone 4)

The Wall Street Journal
Source: WSJ research

Samsung Says...

...THE IPHONE 4 INFRINGES THESE PATENTS:

- PATENT '516**
Manages the phone's resources and battery by prioritizing data
- PATENT '941**
Provides a way to package and transmit data more efficiently

Apple Says...

...THE GALAXY S INFRINGES THESE PATENTS:

- PATENTS '087, '677**
Ornamental design of the iPhone
- PATENT '305** →
Rounded square icons on interface

Captivate
Continuum
Droid Charge
Epic 4G
Exhibit 4G
Fascinate
Galaxy Ace
Galaxy Prevail
Galaxy S →
Galaxy S 4G
Galaxy S II (AT&T)
Galaxy S II (i9100)
Galaxy S II (T-Mobile)
Galaxy S II (Epic 4G)
Galaxy S II (Skyrocket)
Galaxy S Showcase
Galaxy Tab
Galaxy Tab 10.1 (WiFi)
Galaxy Tab 10.1 (4G LTE)
Gem
Indulge
Infuse 4G
Intercept
Mesmerize
Nexus S 4G
Replenish
Transform
Vibrant

PATENT '711
A method allowing multi-tasking while playing music on the phone

PATENT '460
Taking and emailing pictures using a scroll action

PATENT '893
Switching between pictures in a gallery and the camera

PATENT '163
Enlarging documents by tapping the screen

PATENT '915
Distinguishes between single-touch and multi-touch gestures

PATENT '381
'Bounce-back' feature when scrolling beyond the edge of a page

**Apple's 'rubber-banding' patent win stands –
Samsung denied new trial**

<https://9to5mac.com/2013/08/23/>

Trademarks

- A trademark is a distinctive sign that identifies certain goods or services as those produced or provided by a specific person or enterprise.
- It may be one or a combination of words, letters, and numerals.
- They may consist of drawings, symbols, 3D signs such as the shape and packaging of goods, audible signs such as music or vocal sounds, fragrances, or colours used as distinguishing features.
- The initial term of registration is for 10 years; thereafter it may be renewed from time to time.

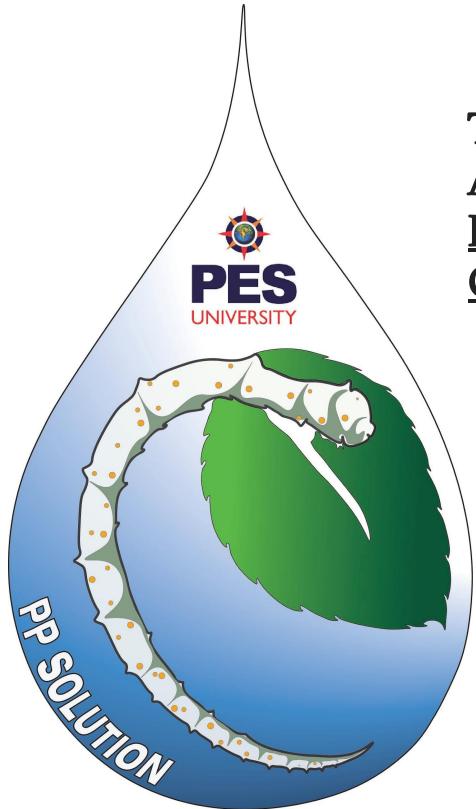
ENVIRONMENTAL STUDIES & LIFE SCIENCES

Intellectual Property Rights



ENVIRONMENTAL STUDIES & LIFE SCIENCES

Intellectual Property Rights



Trade Mark:
Application No.: 3296219
Dated June 28, 2016 in
Class 1

Trademarks

- In principle, a trademark registration will confer an exclusive right to the use of the registered trademark.
- This implies that the trademark can be exclusively used by its owner, or licensed to another party for use in return for payment.
- Registration provides legal certainty and reinforces the position of the right holder, for example, in case of litigation.

Trademarks

- A word or a combination of words, letters, and numerals can perfectly constitute a trademark.
- But trademarks may also consist of drawings, symbols, three-dimensional features such as the shape and packaging of goods, non-visible signs such as sounds or fragrances, or color shades used as distinguishing features – the possibilities are almost limitless
- Trademark rights are private rights and protection is enforced through court orders.

Copyrights and related rights

- Copyright is a legal term describing rights given to creators for their literary and artistic works.
- The kinds of works covered by copyright include:
 - literary works such as novels, poems, plays, reference works, newspapers and computer programs; databases; films, musical compositions, and choreography; artistic works such as paintings, drawings, photographs and sculpture; architecture; and advertisements, maps and technical drawings.



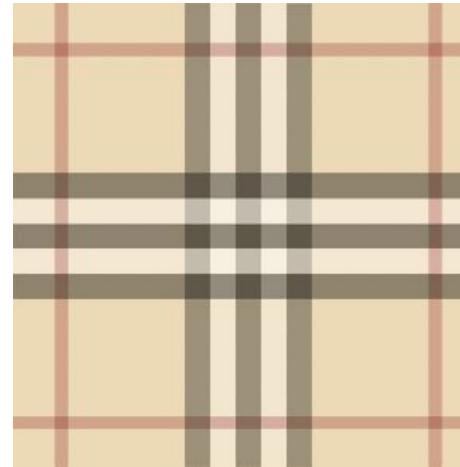
Geographical Indications (GI)

- GI are signs used on goods that have a specific geographical origin and possess qualities or a reputation that are due to that place of origin.
- Agricultural products typically have qualities that derive from their place of production and are influenced by specific local factors, such as climate and soil.
 - Ex: Basmati rice, Darjeeling tea

Industrial Designs

- Industrial designs refer to creative activity, which result in the ornamental or formal appearance of a product, and design right refers to a novel or original design that is accorded to the proprietor of a validly registered design.
- Industrial designs are an element of intellectual property.

- Three-dimensional product (Ex. Shape of a Coca-Cola bottle)
- Two-dimensional product (Ex. Check pattern of burberry)



Trade Secrets

- It may be confidential business information that provides an enterprise a competitive edge may be considered a trade secret.
- Usually these are manufacturing or industrial secrets and commercial secrets.
- These include sales methods, distribution methods, consumer profiles, advertising strategies, lists of suppliers and clients, and manufacturing processes.
- Contrary to patents, trade secrets are protected without registration.

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Google

Layout Design for Integrated Circuits

- Semiconductor Integrated Circuit means a product having transistors and other circuitry elements, which are inseparably formed on a semiconductor material or an insulating material or inside the semiconductor material and designed to perform an electronic circuitry function.
- The initial term of registration is for 10 years; thereafter it may be renewed from time to time.

Protection of New Plant Variety

- The objective of this act is to recognize the role of farmers as cultivators and conservers and the contribution of traditional, rural and tribal communities to the country's agro biodiversity by rewarding them for their contribution and to stimulate investment for R & D for the development new plant varieties to facilitate the growth of the seed industry.

IP Evolution

INTELLECT – PROPERTY – RIGHT

Idea → Expression → COPYRIGHT

Idea → Innovation → Invention → PATENT

Idea → Quality + Identity → TRADEMARK

Idea → Appearance → DESIGN

Idea → Keep Confidential } → **TRADE SECRETS**
No Disclosure

One product – many IP rights

Trademarks

- NOKIA
- Product “225”
- Start-up tone



Copyright

- Software
- User manuals
- Ringtones
- Start-up tone
- Images

Patents and utility models

- Data processing methods
- Operating system
- Operation of user interface

Designs

- Form of overall phone
- Arrangements and shape of buttons
- Position and shape of screen

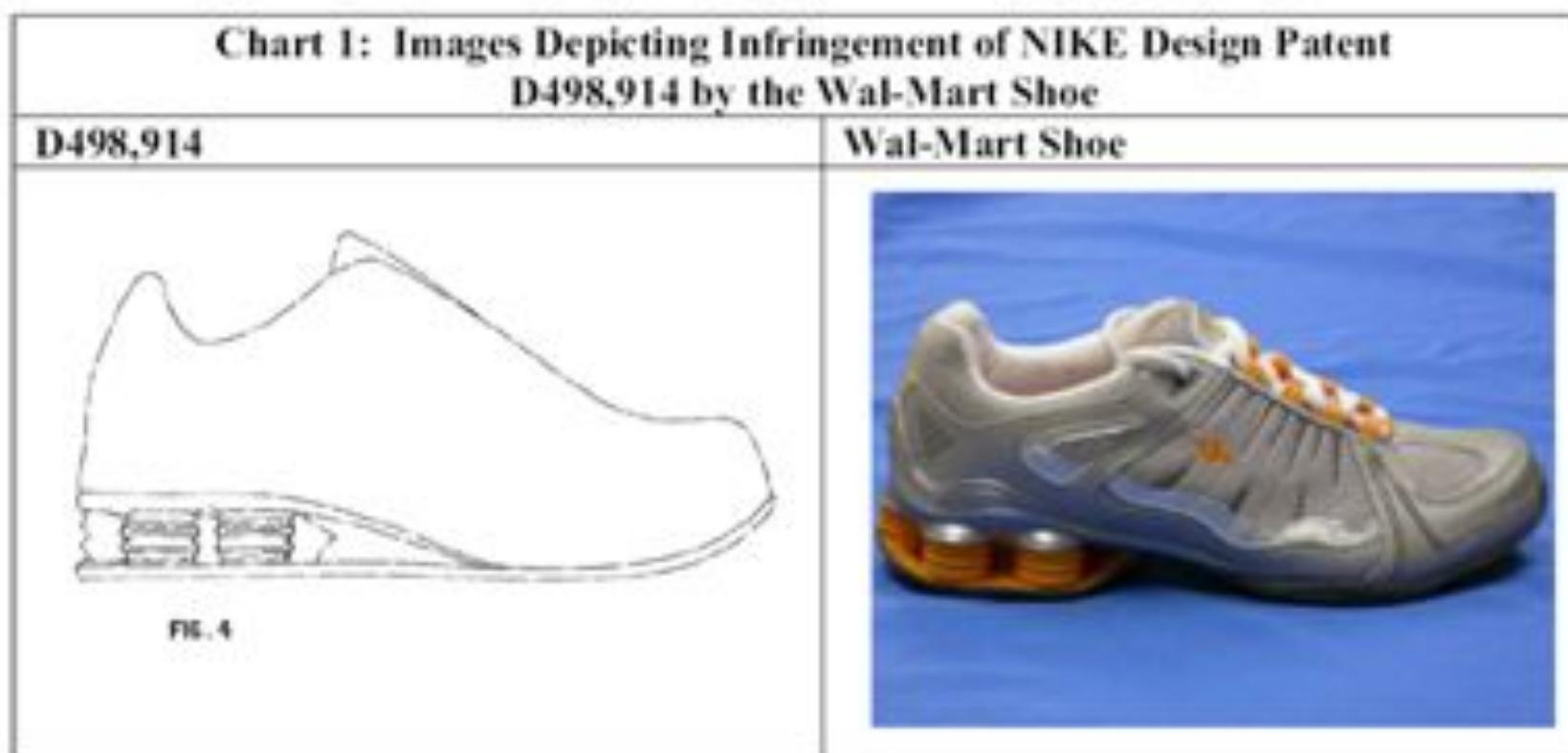
Trade secrets

- Part of technical know-how kept “in-house” and not published

• Remedies for Infringement

- ❖ Administrative(copyright board)
- ❖ Civil Proceedings(starts from district court)
- ❖ Criminal remedies
- ❖ Penalties and Punishments
- ❖ First offence –six months imprisonment and
Rs.50,000/-fine(Section 63)
- ❖ Second offence –one year imprisonment and
Rs.1,00,000/-fine(Section 63 A)
- ❖ Maximum –three years imprisonment and
Rs.2,00,000/-fine

Nike has sued Wal-Mart for design patent infringement asserting infringement of Pat Nos. D498,914



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- “Infringement” of a patent occurs when a competitor makes, uses, sells, offers to sell or imports an embodiment of the invention **without the permission** of the patent owner.



First man jailed in web piracy case

Hong Kong, Nov. 7: A Hong Kong man on Monday was sentenced to three months in prison in what local officials said was the world's first successful prosecution of copyright violation using the popular file-sharing software BitTorrent. Chan Nai-ming, 38, was convicted of illegally uploading three Hollywood films, *Daredevil*, *Red Planet* and *Miss Congeniality*, onto a Web site so that others could obtain them, said Judiciary spokesman Mackenzie Mak.

Mr Chan is the first person in the world to be convicted and jailed for illegal online sharing of copyrighted material using the BitTorrent software, said customs spokeswoman Glenis Liong.



Pirated goods openly on sale at a shopping mall in Hong Kong. (AFP)

The software allows users share large chunks of data in a speedy way. But movie and music industries say the illegal online sharing of files causes them losses of millions of dollars a year. Mr Chan was found guilty last month of three counts of attempting to distribute copyrighted material without authorisation. The magistrate who convicted him said his act greatly hurt the interest of the copyrighted material's owner although he did not make any profit from uploading the movies onto the Internet. Because of its speed, BitTorrent steadily gained in popularity after the recording industry began cracking down on users of Kazaa and Morpheus, established file-sharing software. (AP)

Intellectual rights cases to get top priority, says CJI

By Dhananjay Mahapatra/TNN

New Delhi: Giving the first official recognition to the importance of intellectual property rights (IPR) cases in a fast developing economy like that of India, Chief Justice of India Y K Sabharwal on Saturday promised to put all such litigations in the fast track system for their early disposal.

This promise he dished out at the 51st Council meeting of Asian Patent Attorneys Association (APAA) here amidst applause from a large gathering of jurists from Asian countries.

Underlying the importance of intellectual property rights and protection of trademarks for foreign companies to venture into the domestic market, Justice Sabharwal promised to include IPR cases in his priority list, which he had unveiled as Chief Justice designate, to be put on fast track trial. The priority list was originally meant to include corruption cases against high and mighty and cases against old and infirm.

This was an impromptu promise by the CJI as his written speech did not contain any reference to the IPR cases. He said, "Any delay in deciding such cases would promote deceit and counterfeit and every attempt should be made to put these type of cases on fast track."

He said much before the world judiciary realised the importance of intellectual property rights, it was the Indian judiciary which took timely action in protecting



Y K Sabharwal

what was known then as Patents or Trade Marks. "Our judiciary has been proactive in protecting trademarks much before the TRIPS agreement took effect," the CJI said.

He reeled out statistics: patent application filing in India has gone up from 5000 in 1999 to 17,000 in 2004 and issuance of 2 lakh trademark certificates in last two years to lay stress on his view that India has kept pace with the dynamics of the field.

Jyoti Sagar, APAA Indian group president, narrated a joke to illustrate how important the trademarks have become. Two persons debating over a picture - whether it was a crocodile or alligator - went to a arbiter, who after having a look at the picture exclaimed: "it looks like lacoste!"

APAA president Dato Karan said in today's world the struggle is for economic and technological superiority. Technological supremacy comes from creation, marketing and mastering a brand, which is intellectual property.



THANK YOU

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