




BIOMEDICINE IN THE 21ST CENTURY

Section One

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INTRODUCTION TO BIOMEDICINE IN THE 21ST CENTURY

Chapter 1

TRANSITION OF WESTERN MEDICINE

- There has been a dramatic alteration of western medical practice in the last century
- Some for the better, some for the worse
- 1900
 - Leading causes of disease – acute infections
 - Lifespan 47
- Today, most deaths are due to chronic long-term illness
 - 50% of all deaths affected by lifestyle
 - 75% of all diseases affected by lifestyle



- By 2025 there will be 800 million over 65 worldwide
 - 2/3 will be in developing countries
 - This will have enormous health consequences for all countries
- USA census data shows that over 65 is the fastest growing demographic
- “Old old” is a geriatric term for over 85
 - Projected to increase 2-5 times over the next 30 to 50 years
- “Elite old” is geriatric term for over 100
 - Many international studies try to study what they and their parents or grandparents did right
- In 2011, the leading edge of the boomers (1947-1964) will turn 65



LIFE EXPECTANCY IN THE YEAR 2000

- All Americans – at birth 76.9
- All Americans – at age 65 17.9

- All Males – at birth 74.1
- All Males – at age 65 16.3

- All Females – at birth 79.5
- All females – at age 65 19.2



NUMBER OF DEATHS FOR LEADING CAUSES OF DEATH

- Heart disease: 631,636
- Cancer: 559,888
- Stroke (cerebrovascular diseases): 137,119
- Chronic lower respiratory diseases: 124,583
- Accidents (unintentional injuries): 121,599
- Diabetes: 72,449
- Alzheimer's disease: 72,432
- Influenza and Pneumonia: 56,326
- Nephritis, nephrotic syndrome, and nephrosis: 45,344
- Septicemia: 34,234
- [Death Statistics Tables](#)



LIFESTYLE RELATED DISABILITY AND DEATH IN THE USA

- Cigarette smoking
- Alcohol abuse
- Unhealthy diet [Dr. Weil on The Worst Diet](#)
- Lack of exercise
- High-risk sexual behavior
- Poor stress management
- Lack of social support
- Pessimistic outlook, cynicism and poor anger control



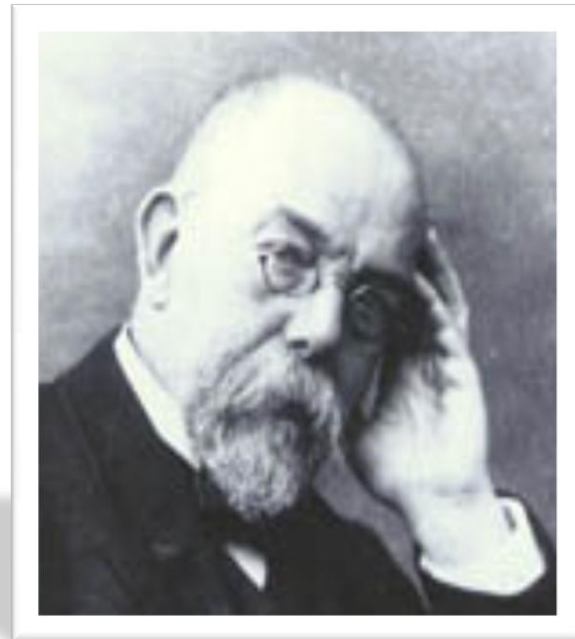
HOW DID WE GET HERE AS A HEALTHCARE SYSTEM?

- The present western medical paradigm is the biological model from the 1800s
 - Evidence that infectious diseases were caused by microorganisms
 - Due to the discoveries by Robert Koch, a German Physician and Louis Pasteur, a French medical researcher
 - Landmark studies identified that bacteria caused disease in the 1870s
 - First discovered bacteria was anthrax, then tubercle bacillus
 - Pasteur experimented with milk and wine fermentation and spoiling in the 1850s



ROBERT KOCH (1843-1910)

- Building upon Pasteur's Germ Theory, was the first to cultivate anthrax bacteria outside
- The purpose of this laboratory test was to learn the extent to which microorganisms contributed to diseases

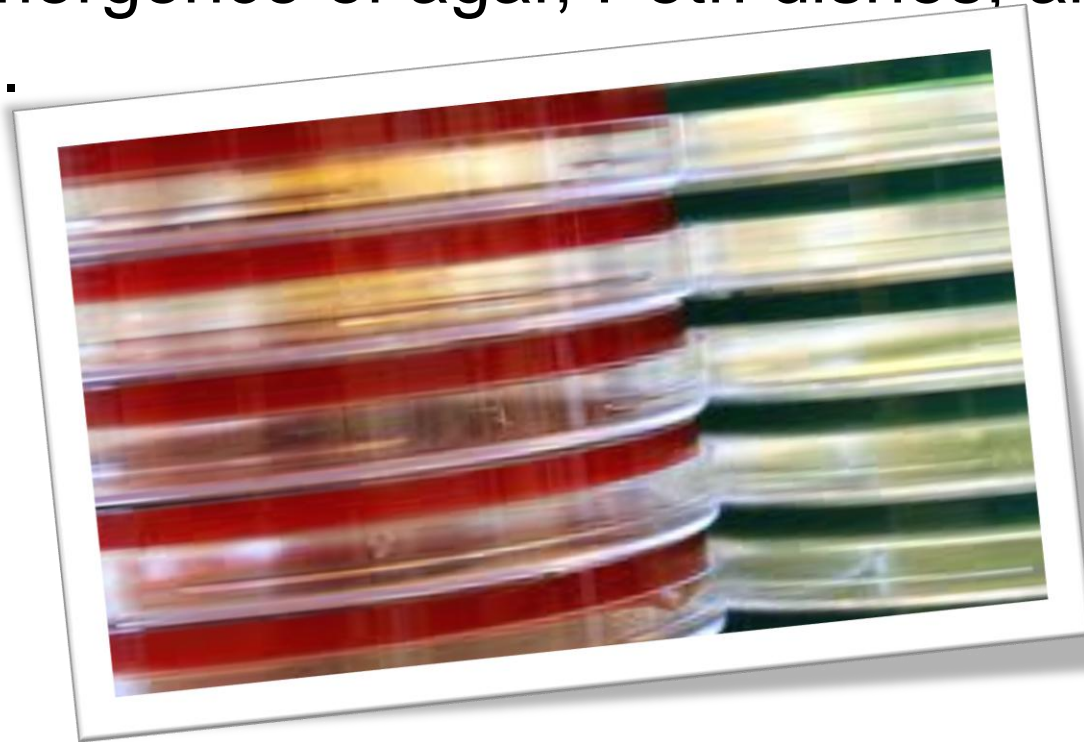


KOCH'S POSTULATES

1. An organism can be isolated from a host suffering from the disease **and**
2. The organism can be cultured in the laboratory **and**
3. The organism causes the same disease when introduced into another host **and**
4. The organism can be re-isolated from that host **then**
 - The organism **is** the cause of the disease and the disease **is** an infectious disease.



- Koch's ideas eventually led to the development of pure culture techniques and the emergence of agar, Petri dishes, and stains.

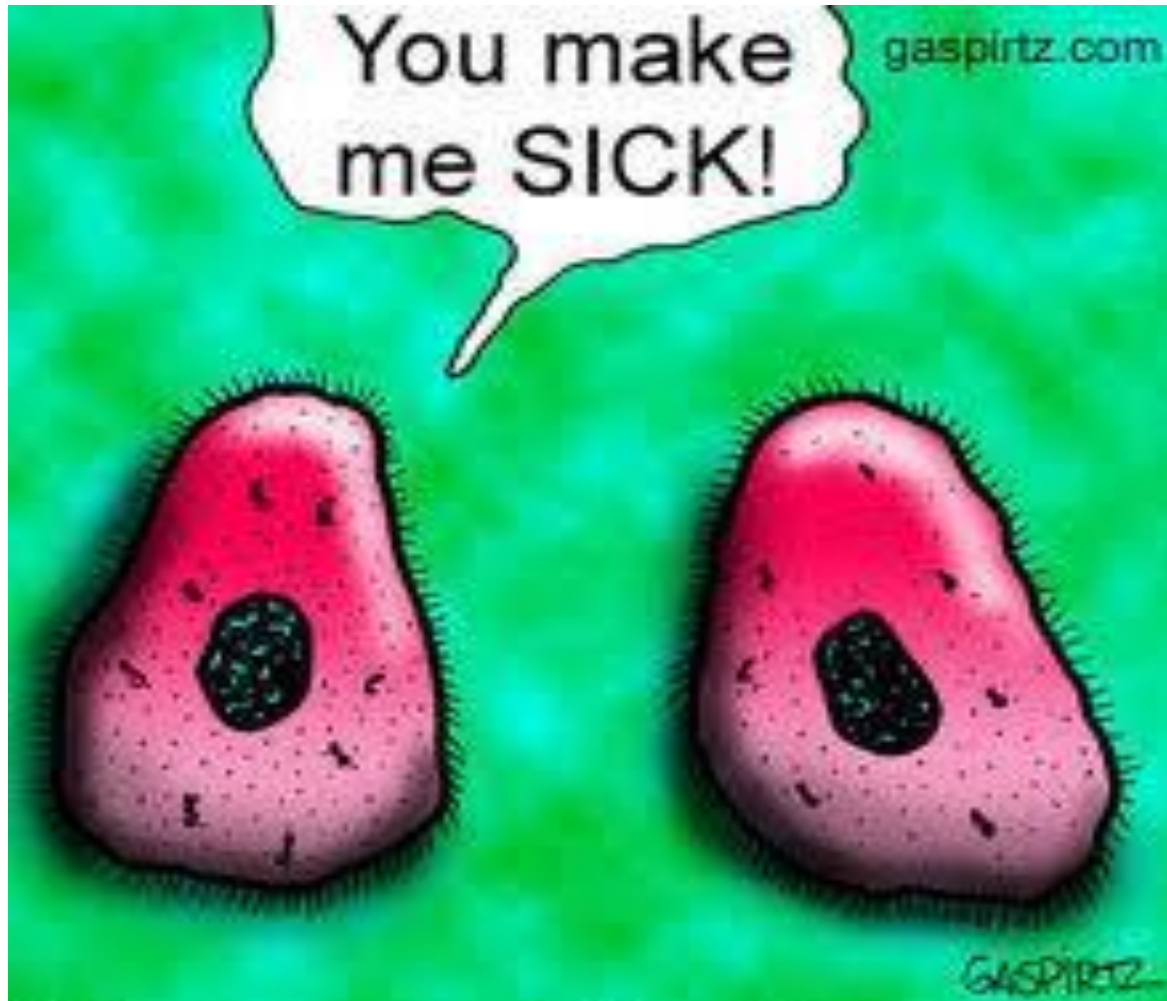


CELL THEORY

1. Every living organism is made of one or more cells.
2. The cell is the basic unit of structure and function. It is the smallest unit that can perform life functions.
3. All cells arise from pre-existing cells.



WHEN GERM RELATIONSHIPS GO BAD !



KOCH POSTULATES

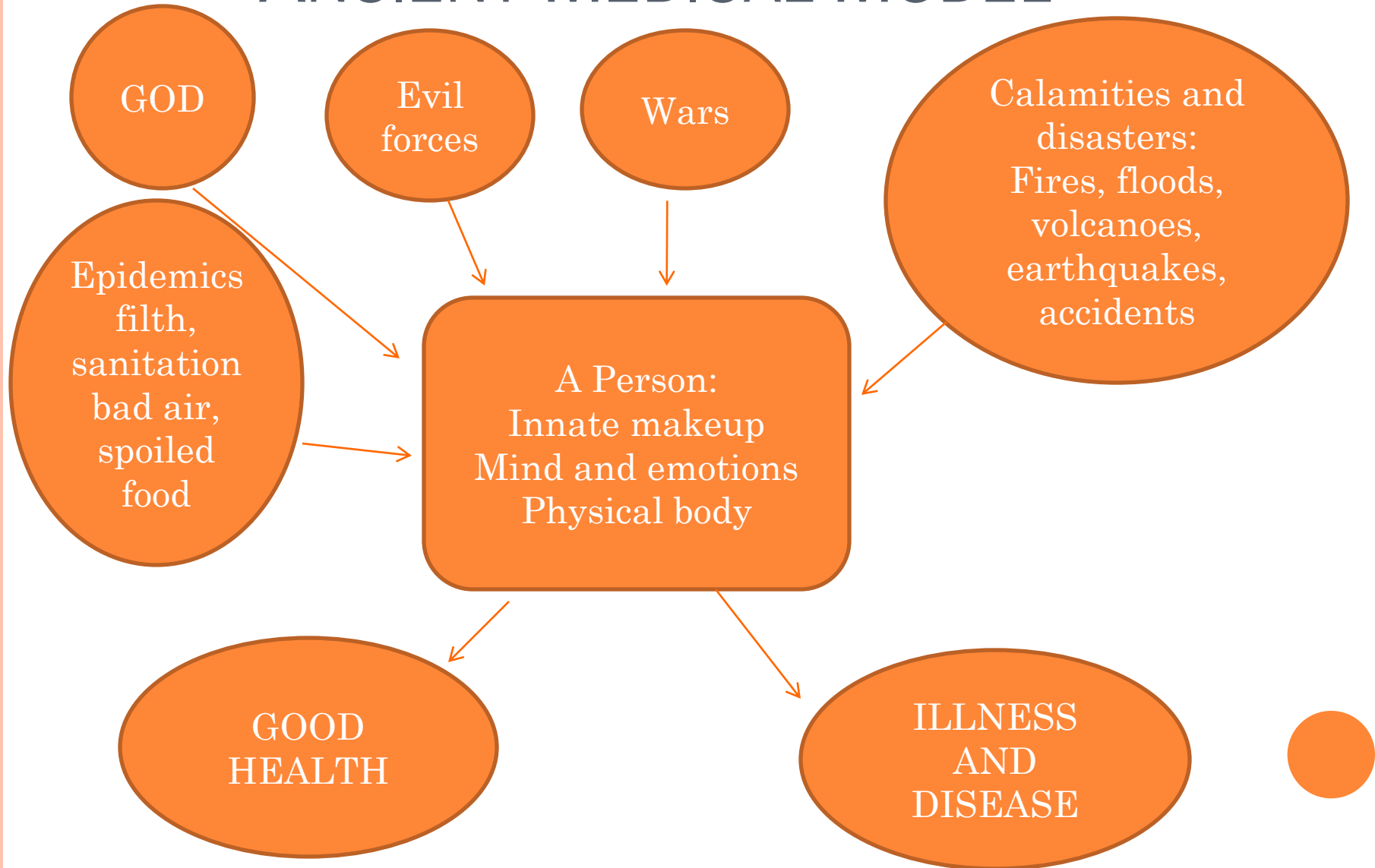
- The microorganism must be found in abundance in all organisms suffering from the disease, but not in healthy organisms.
- The microorganism must be isolated from a diseased organism and grown in pure culture.
- The cultured microorganism should cause disease when introduced into a healthy organism.
- The microorganism must be re-isolated from the inoculated, diseased experimental host and identified as being identical to the original specific causative agent.



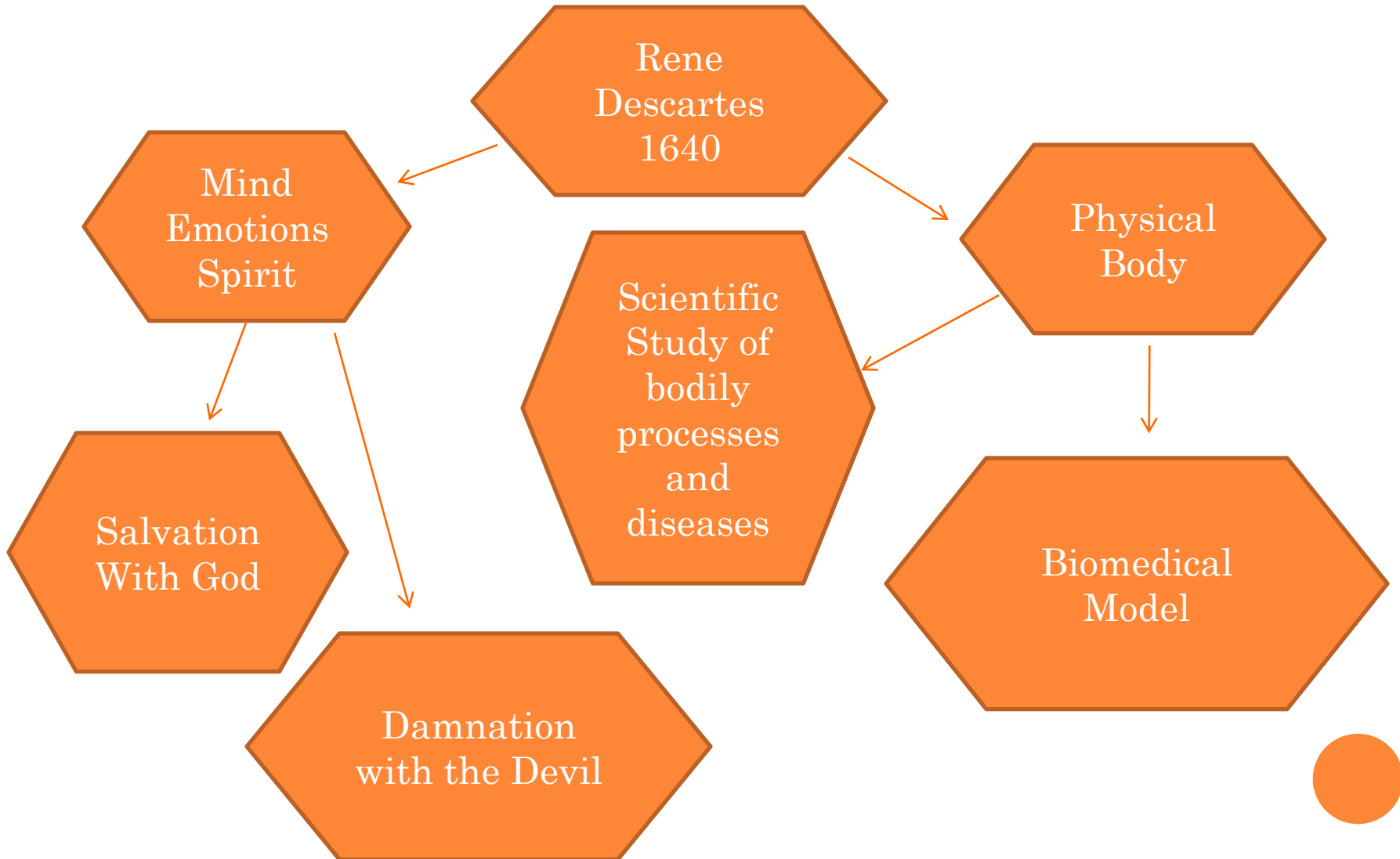
- It was not until the 20th century that viruses were identified as the cause of many diseases
 - Could not be seen until the invention of the electron microscope in 1930
 - Cold, influenza parasites, fungi, rickettsia
- The biological model from the 19th and 20th centuries is still the standard of medical thought
- Thus the key to current medical practice is to identify the biological source and treat it with drugs, antibiotics and surgery
 - What are some points that is missing from this model?



ANCIENT MEDICAL MODEL



MEDICAL MODEL POST DESCARTES



A NEW MODEL FOR THE 21ST CENTURY

- Biopsychosocial Model
 - Takes into account the mainstream medical model and adding psychoneuroimmunology and complimentary and alternative medicine
- Overcoming the warrior approach to medical practice
 - The doctor is the warrior with all their weapons
 - They are the warrior who comes to battle the patient's illness
 - This brings an attitude with it
- The warrior approach is slowly giving way to the “mutual discovery” approach
 - Dr. and patient work together



BENEFITS OF THE BIOPSYCHOSOCIAL MODEL

- Decentralized technology-based medical practices into community-based smaller clinics
 - Most patients recover better when close to homes and ethnics communities
- Home-based terminal care nursing
 - $\frac{3}{4}$ of medical expenses spent in life occur in the last 30 days of life
- Covenant-based medical practice
- Integration of CAM
- Emphasizing preventive medicine





PREVENTIVE MEDICINE IN THE 21ST CENTURY

Chapter 2

“AN OUNCE OF PREVENTION IS WORTH A POUND OF CURE”

- Major causes of increased lifespan
 - Reduced infant mortality
 - Vaccination and immunization
 - Safe-drinking water and pasteurized milk
 - Sanitation
 - Sewage disposal and treatment
 - Better nutrition and adequate food
 - Surgical technology
 - Aseptic techniques, anesthesia, blood banks, tissue and organ transplants, neonatal surgery
 - Paramedic and EMT teams
 - ICUs
 - Better medication



○ Other ways Americans have improved in the last 25 years:

- Smoking decreased from 50% to 25%
- Decline alcohol abuse rate
- Use of seatbelts with a 50% reduction of fatalities
- Influence of MADD
- Safer sex practices, especially since advent of AIDS
- Decreased substance abuse
- Better diets and emerging health awareness
- Awareness of importance of exercise
- More mammography, colon studies and prostate checks
- Fewer x-rays
- Industrial cleanup
- Less indiscriminate use of antibiotics
- Many involve in spiritual activities



PRIMARY PREVENTION

- Preventing disease before it starts
 - Immunizations
 - Fitness classes
 - Only 20% get regular and sufficient exercise
 - Nutrition classes
 - Use of sunscreen
 - Stop smoking programs
 - Substance abuse programs
 - Vitamin supplementation
- The cost of primary prevention is always a good bargain.

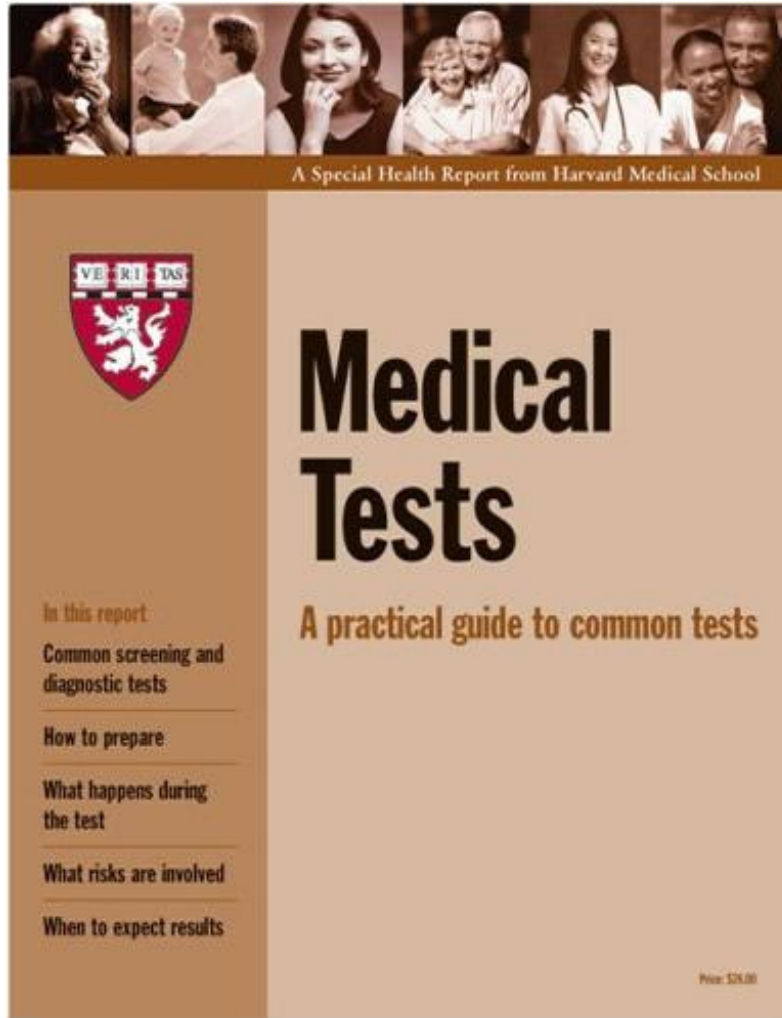


SECONDARY PREVENTION

- Screening at risk people
 - Mammography
 - PSA blood tests and prostate exams
 - Blood pressure clinics
 - Cholesterol testing
 - Stool exams
 - Colorectal scopes
 - Testing for hearing and visual in children and elderly
 - HIV testing for those at risk



HARVARD DIAGNOSTIC TESTS HEALTHFINDER.GOV



SCREENING IN THE 20S

- Height and weight – every 3 years
- Blood pressure – at all appointments, at least every 3 years, more if at high risk
- Cholesterol screening –at least every 5 years
- Diabetes screening – every 3 years for those at risk
- Chlamydia and STD screening – yearly for those who are sexually active and non-monogamous
- Glaucoma screening – every 3-5 years
- Melanoma screening – every 5 years



SCREENING IN THE 30s



- Height and weight – every 3 years
- Blood pressure – at all appointments, at least every 3 years, more if at high risk
- Cholesterol screening –at least every 3 years
- Glaucoma screening – every 2-4 years
- Melanoma screening – every 5 years



SCREENING IN THE 40s



- Height and weight – every 3 years
- Blood pressure – at all appointments, at least every 3 years, more if at high risk
- Melanoma screening – every 5 years
- Cholesterol screening –at least every 3 years
- Diabetes screening – every 3 years for those at risk
- Colonoscopy – every 10 years
- Occult blood test and sigmoidoscopy – every 5 years
- Prostate cancer screening – for men at risk



SCREENING IN THE 50s



- Height and weight – every 3 years
- Blood pressure – at all appointments, at least every 3 years, more if at high risk
- Melanoma screening – every 5 years
- Cholesterol screening – at least every 3 years
- Diabetes screening – every 3 years
- Colonoscopy – every 10 years
- Occult blood test and sigmoidoscopy – every 5 years
- Prostate cancer screening – for men at risk



SCREENING IN THE 60S

- Height and weight – every 3 years
- Blood pressure – at all appointments, at least every 3 years, more if at high risk
- Melanoma screening – every 5 years
- Cholesterol screening – at least every 3 years
- Diabetes screening – every 3 years
- Colonoscopy – every 10 years
- Occult blood test and sigmoidoscopy – every 5 years
- Prostate cancer screening – for men at risk
- Glaucoma screening – every 2-4 years until 65, then every 1-2 years





PSYCHONEUROIMMUNOLOGY

Chapter 4

- PNI experiments started in the 1970s
- Examines how the immune system is influenced by physical and emotional stress and how this influences health
- The research has established a direct relationship between psychological stress, immune system dysfunction and the development of disease
- Some studies have shown stress to be more of a contributor to a viral infection than lack of sleep, diet, or even WBC count
- One study showed the effect of exam stress
- Numerous cardiac studies
- Three Mile Island disaster study



PHYSIOLOGIC EFFECTS OF INCREASED STRESS

- Increased cold sores
- Increased headaches
- Increased viral and bacterial infections
- High blood pressure
- Cardiac problems
- Menstrual disorders in women
- Increased impotence
- GI problems
- Skin problems
- Asthma exacerbations
- Flare-ups of rheumatoid arthritis
- Worse prognosis with depression, GAD, PTSD
- Increased incidence of preterm babies





PHYSICAL FITNESS & HEALTH

Chapter 5

- Regular exercise is one of the most important measure of health
- Lack of exercise is a major risk factor of heart and stroke involvement
- Different kinds of exercise
 - Workout exercise
 - Isometric – tensing muscles to increase tone
 - Isotonic – weight lifting and calisthenics
 - Isokinetics – weight lifting in alternate directions
 - Physiologic exercise
 - Anaerobic exercise
 - Aerobic exercise



ASPECTS OF PHYSICAL FITNESS

- Muscle strength
- Endurance
- Body flexibility
- Body balance
- Cardio-respiratory fitness
- Weight vs. height
- Percentage of muscle vs. fat
- Organic fitness
 - Basic inherent fitness that one has at all times, given age, genetic and general state of health
- Dynamic fitness
 - Increased fitness that results from regular exercise and conditioning



MEDICAL BENEFITS OF EXERCISE

- Cardiovascular benefits
 - London bus workers study
 - Postal workers study
 - Longshoreman study
 - Framingham study
- Protection against colon cancer
- Protection against all forms of cancer
- Increased work performance and productivity
- Sustained capacity
- Increased longevity



PSYCHOSOCIAL BENEFITS OF EXERCISE

- Exercise is associated with better management of stress, anxiety and depression

How Much Exercise is Enough?

- Higher exercise levels were no more effective than lower levels
- What is needed is slow jog or brisk walk for 25-30 minutes every other day

Hazards of Exercise

- Injuries
- Excessive sun exposure
- Frostbite
- Effects on relationships





HEALTH HAZARDS OF SMOKING

Chapter 6

DISEASES DIRECTLY RELATED TO SMOKING

- Chronic bronchitis
- Bronchiectasis
- Emphysema
- COPD
- Cancer of lungs
- Cancer of esophagus, stomach, oral cavity, breast, bladder, pancreas
- Atherosclerosis of heart, cerebral vessels

- Ulcers
- Facial wrinkles
- Periodontal & dental
- Hearing loss
- Macular degeneration
- Ovarian cysts
- Osteoporosis
- Impotence and sexual difficulties





MEDICAL CONSEQUENCES OF ALCOHOL ABUSE

Chapter 7

DEMOGRAPHICS

- 55-60% of all adults in the USA are occasional drinkers
- 15% of adults are binge drinkers
- 5% are heavy drinkers
- How much is abuse?
 - Male at more than 5 drinks per day
 - Female at more than 4 drinks per day
 - Problem drinking more common in whites
 - Problem drinking often begins in early life



DEFINITIONS

○ Tolerance

- Abusers of alcohol need more and more alcohol to have the same effects

○ Dependence

- Physical dependence
 - The person must consume regular amounts of alcohol (or other substance) to keep from going into withdrawal
- Psychological dependence
 - The person “needs” the substance for psychological reasons

○ Withdrawal

- Going without the substance causes the opposite effect of the substance

DIRECT HAZARDS OF ALCOHOL ABUSE

- Liver involvement
 - degeneration and fatty infiltration
 - Cirrhosis due to scar tissue buildup
 - Failure often follows cirrhosis
- Gastric & esophageal hemorrhage
 - Due to ruptured varices
- Alcohol dementia – aka Korsakoff's syndrome
- Cancer of esophagus, stomach, liver, oral cavity and breast
- Heart disease leading to heart failure
- Infertility is greatly increased
- FAS – fetal alcohol syndrome



INDIRECT HAZARDS OF ALCOHOL ABUSE

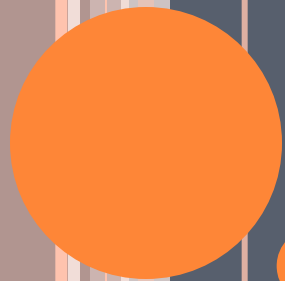
- Traffic fatalities
 - 50% are alcohol related
- Industrial accidents, accidents at home, etc.
- Homicides
 - 2/3 are alcohol related
- Suicides
 - 30% of all suicides are alcohol related
 - 40% of all alcoholic women attempt suicide
- Other effects
 - Families and relationships



HEALTH BENEFITS OF LIGHT ALCOHOL CONSUMPTION

- Protection against atherosclerosis
 - Kaiser Permanente study
 - Framingham Study
 - Albany Study
- Protection against cognitive defects
 - Ruitenbergh Study
- How much is best for health benefits?
 - 1.5 drinks per day for men
 - 1 serving= 5-6 ounces wine or 12 ounces beer or 1.5 ounces hard liquor





SUBSTANCE ABUSE

Chapter 8



- Compared to the deadly of cigarettes, sedentary lifestyles, alcoholic abuse, and poor dietary choices, relatively few Americans die from the effects of street drugs
- Cocaine is the deadliest of street drugs
 - 1000 Americans die from tobacco for every cocaine-related death



FDA CLASSIFICATIONS

- Schedule I
 - High abuse potential with no accepted medical usage
- Schedule II
 - High abuse potential, but some medical use
 - Opiates, barbiturates, amphetamines, cocaine
- Schedule III
 - Low to moderate abuse potential
 - Some tranquilizers
- Schedule IV
 - Low abuse potential with many medical uses
 - Codeine, valium, some tranquilizers
- Schedule V
 - Very low abuse potential
 - All OTC meds



HOW ARE THEY DISPENSED

- Schedule I
 - Cannot be prescribed or legally used
- Schedule II
 - Requires a triplicate prescription
- Schedule III
 - Requires a regular prescription
- Schedule IV
 - Requires a regular prescription
- Schedule I
 - No prescription needed – “Over-the-counter”



PSYCHOTROPIC DRUGS

○ Stimulants

- Cause euphoria, increased heart rate, pupil dilatation, and sometimes hallucinations
- Amphetamines
 - Often used as diet pills
- MDMA – methylenedioxymethamphetamine
 - AKA Ecstasy
- Cocaine
- Caffeine

○ Depressants

- Transquilizers
- Sedatives
- Alcohol



○ Narcotics

- Morphine, codeine, heroin, opium, Demerol, methadone

○ Hallucinogens

- Marijuana
- LSD, PCP. Mescaline, peyote

○ Anabolic steroids and hormones

- Cortisone, testosterone, growth hormone

○ Streetdrugs





PSYCHOSOMATIC ILLNESS

Chapter 9

PSYCHOSOMATIC ILLNESS

- Physical symptoms and illness directly caused by psychological and emotional factors
- Common features
 - Subjective complaints with no physical evidence
 - Symptoms are very real
 - Real pain, spasm, palpitations, etc.
 - Symptoms are not intentionally caused
 - Symptoms are from mild to severe
 - Multiple organs systems may be involved
 - Correlation between exacerbation of symptoms and psychological stress



○ Organ involvement

- There is often a vulnerability of one organ to stress
- This is the “target” organ in the patient

○ Predisposing conditions

- Modeling of other family members is a powerful factor in the start of these disorders
- Personality factors are important
- Exposure to severe stress can be a major factor



PSYCHOSOMATIC DISORDERS

- Conversion disorders – hysteria
 - Brought on by an intense stressful experience
 - A conversion disorder may last forever or it may reverse latter in life
 - Examples of conversion disorders
 - Hysterical amnesia
 - Psychosomatic blindness
 - Mutism – the inability to speak
 - Paralysis



- Somatization disorders
 - Presents with multiple symptoms involving several organ systems
 - Always includes esophageal spasm
 - May include palpitations, hyperventilation, pain
- Somatic pain disorder
 - History of severe pain, often tied to a known diagnosis
 - These patients never get better
- Hypochondriac disorder
 - Inordinate fear of having or getting a disease
 - Intense preoccupation with the body
- Idiopathic disorders with strong psychological overlay



DISORDERS ASSOCIATED WITH MISREPRESENTATION

- With these disorders, the patient intentionally produces symptoms or actual illness. There are two basic categories:
 - Factitious disorder – person fakes an illness or has an intentional injury
 - Seen often in healthcare workers with access to meds
 - Munchausen-by-proxy
 - Malingering
 - Intentional faking of symptoms or intentional injury for a recognizable goal

