

Biomedicine in the 21st Century

Section 1

Transition of Western Medicine – Chapter 1

- 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

Lifestyle Related Disability and Death in the USA

- Cigarette smoking
- Alcohol abuse
- Unhealthy diets
- 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?

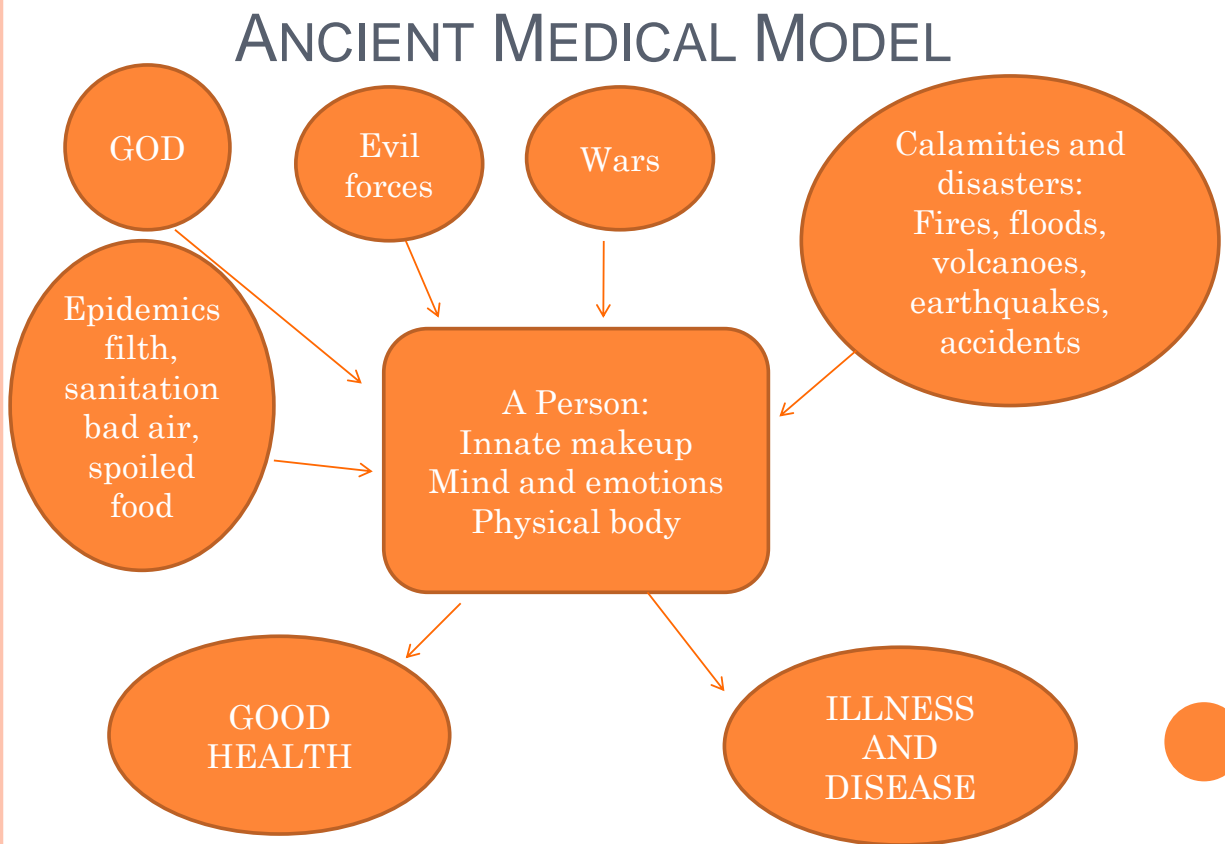
- The present western medical paradigm is the biological model from the 1800s
- Evidence that infectious diseases were caused by microorganisms
- Due to the discoveries by Robert Koch, a German Physician and Louis Pasteur, a French medical researcher
 - Landmark studies identified that bacteria caused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

Koch Postulates

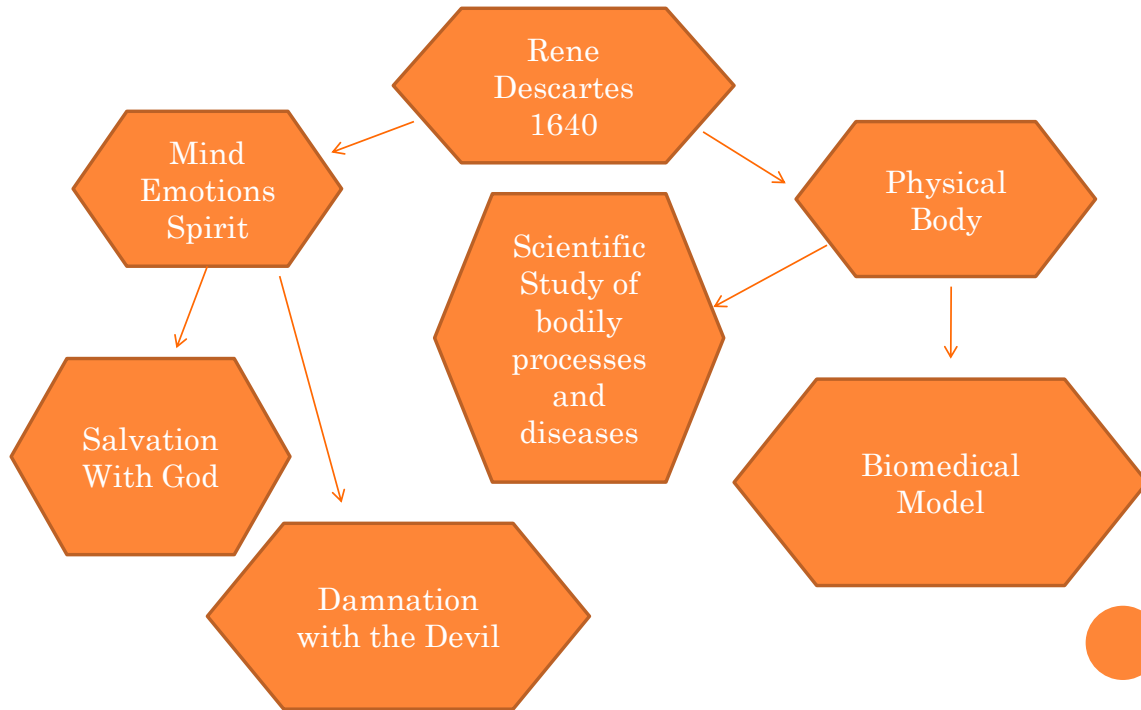
- The microorganism must be found in abundance in all organisms suffering from the disease, but not in healthy organisms.
- The microorganism must be isolated from a diseased organism and grown in pure culture.
- The cultured microorganism should cause disease when introduced into a healthy organism.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

Koch Postulates - continued

- 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?



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 deal

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
- <http://www.health.harvard.edu/diagnostic-tests/>
<http://www.healthierus.gov/prevention.html#recc>

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

Screening in the 50s - continued

- 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
 - Farmington 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 and 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 and 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

Direct Hazards of Alcohol Abuse - continued

- 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

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
 - Heroin, Marijuana
 - No proven therapeutic indication
 - High abuse potential
 - No FDA approval
 - Usually used only for research purposes
- Schedule II
 - Narcotics
 - Opiates, barbiturates, amphetamines, cocaine
 - Limited therapeutic indications
 - High abuse potential
 - FDA-approved clinical indications
 - Records: Receipt and dispensing at Pharmacy and Physician's office
 - Needs special order forms
 - Need DEA number to prescribe
 - No refills
- Schedule III
 - Some tranquilizers
 - Limited therapeutic applications
 - Low to moderate abuse potential
 - FDA-approved applications
 - Records: Need DEA number to prescribe
 - Maximum of five refills in 6 months
- Schedule IV
 - Codeine, valium, some tranquilizers
 - Low abuse potential with many medical uses
 - FDA-approved applications
 - Records: Need DEA number to prescribe
 - Maximum of five refills in 6 months
- 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
 - Tranquilizers
 - Sedatives
 - Alcohol
- Narcotics
 - Morphine, codeine, heroin, opium, Demerol, methadone
- Hallucinogens
 - Marijuana
 - LSD, PCP, Mescaline, peyote
- Anabolic steroids and hormones
 - Cortisone, testosterone, growth hormone

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