

Course Proposal
Science and Medicine at Colorado College
Douglas Jacobson, 3rd year medical student, Yale Medical School

Course Description:

This course will include an overview of the history of science and medicine, a critical analysis of current topics in health care, interpretation of evidence-based medicine, and a module of practical skills, including first aid and CPR.

Course Objectives:

By the end of this course students will be able to:

- Critically evaluate scientific literature
- Analyze current topics in biomedical sciences
- Perform CPR, first aid, and other basic medical procedures
- Make informed career choices within health care professions

Syllabus/Course Schedule:

Each week will consist of the following format:

Monday

History of Science and Medicine.

Each week we will cover a relevant topic in the history of science and medicine. These topics will include the history of anatomy, sanitation, and germ theory and infectious diseases.

Tuesday

Discussion and Lecture.

Topics will include medical ethics, alternative medicine, health care economics and the modern health care crisis.

Wednesday

Current Topics in Science and Medicine

Students will present of relevant current topics in science and medicine, including stem cell research, euthanasia, abortion, clinical trials and human experimentation, and generic drugs. These presentations will allow students to critically analyze both sides of important medical and scientific debates.

Thursday

Discussion and Lecture.

Topics will include interpreting science into medicine, and careers in health care.

Friday

Practical Skills.

Students will learn CPR, first aid and wilderness survival, suturing, and episiotomy.

Science in Medicine FY180

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“Medicine is a science of uncertainty and an art of probability” - Sir William Osler

Course overview:

The aim of science is to reduce uncertainty. However, science, being a human endeavor, is inherently fraught with error and uncertainty. Scientific “fact” is constantly changing. Medicine, being a science whose subject is people, is particularly filled with uncertainty. The emergence of science in medicine has done much in the past two hundred years to reduce the uncertainty surrounding illness, and we will explore how this process has evolved and how it is at work today. Nevertheless, uncertainty remains in medicine. It is present in every medical statement, decision, and treatment. It is often hidden, neglected, or under appreciated by scientists, physicians, and especially the public. One of the primary goals in this class will be to learn to expose this uncertainty. In other words, we will be skeptical, ask questions, critically analyze medical claims and practices and we will try to distinguish fact from myth because this is how medicine progresses. We will also explore how the art of medicine is used in combination with scientific knowledge to make difficult decisions and how uncertainty is dealt with in these situations.

Course objectives:

- To understand the role that science currently plays in medicine from a historical and global perspective
- To understand the scientific process that leads to advances in medicine
- To be able to critically evaluate research studies and medical claims in the media
- To understand the basis of medical decision making and the role science plays
- To appreciate the inherent imperfections and limitations of science in medicine
- To learn practical skills in medicine such as CPR, wilderness first aid, interpreting EKGs and suturing.
- To enjoy your 8th block

Resources:

- 1) Porter, Roy, Blood and Guts: A Short History of Medicine
- 2) Gawande, Atul, Complications: A Surgeon's Notes on an Imperfect Science
- 3) Sherwin Nuland, How We Die: Reflections on Life's Final Chapter

Projects:

Papers: Four papers will be due during the Science in Medicine class. The details for each paper will be listed below. The papers will be due at the beginning of class on the date specified. Late papers will not be accepted unless arrangements are made in advance for special circumstances. Print papers in times new roman 12 point font double spaced.

Presentations: Each student will give three presentations during the Science in Medicine class. Conveniently, the topic of your presentation will correspond to the papers that you will also write for the class. However, please remember that this is a presentation to a live audience. You are not to read your paper aloud. Rather, make your presentation interesting and interactive. You may use an outline to guide you, but your presentation should highlight the most important things you learned from the research you did in creating your paper and should be, as much as possible, from memory. Most importantly, be creative and have fun.

1) Paper and Presentation I: History of Medicine

3-5 pages, due 1st Friday (April 29, 2005)

a. Option 1

Pick a health condition and describe how its explanatory model has changed over time, focusing on the historical description.

b. Option 2

Pick a historical idea, invention, person, or event that had an impact (positive or negative) on the evolution of science in medicine and discuss how this influenced the role of science in medicine.

c. Five minute presentation to class on 1st Friday.

2) Paper and Presentation II: Complementary and Alternative Medicine

3-5 pages, due 2nd Friday (May 6, 2005)

- a. Choose an area of complimentary and alternative medicine that interests you. You may choose from the list provided or if you have an area of interest not included on the list you may choose that topic only after getting approval.

- b. Investigate the history, origins and background of your health practice. Determine the foundations of the healing tradition including underlying philosophy and views the body, health, healing, disease and treatment. Discuss training standards and techniques used in that specialty. Review any scientific foundations or scientific studies that support, refute or evaluate the effectiveness of the health practice.
- c. Give a 5 minute presentation on the 2nd Friday of the class.

3) Paper III: Careers in Health Care

3-5 pages, due 3rd Wednesday (May 11, 2005)

a. Choose a career in the health professions from the list provided. You may investigate a career that does not appear on the list if you obtain prior approval. Your paper and presentation will include but does not need be limited to the following.

- a) History and background of the career
- b) Prerequisites for enrolling in the training program
- c) Educational requirements and/or training
- d) Certifications and/or degrees needed
- e) Work environment and responsibilities
- f) Salary or pay
- g) Specialization and/or advanced degrees
- h) Optional - Role model in that career

Hint: pick a career that interests you and do your best to convince your reader that this career is exciting and worth-while.

4) Paper IV: Critical Analysis

5-8 pages, due 4th Monday (May 16th, 2005)

- a. Critically evaluate the scientific merit and limitations of a contemporary medical/health claim (from anyone, anywhere) by comparing and contrasting the claim to the results of a clinical research paper that addresses the topic.

- b. Included in the evaluation should be a critical analysis of formal research done on the topic with a discussion of the limitations of the research.
- c. Also include a discussion of what can (in your opinion) be objectively concluded about the topic (if anything) and what could be done to further clarify the issue (if it isn't completely resolved)
- d. References: at least one clinical research paper (not a review article)
- e. Eight to ten minute presentation to class on 4th Monday.

Grading:

- 25% Class Participation
Preparation for class, familiarity with assigned material, contributing to discussion, asking questions and sharing your ideas.
- 20% Presentations
5% Presentation I, 5% Presentation II, 10% Presentation IV
- 40% Papers
10% Paper I, 10% Paper II, 5% Paper III, 15% Paper IV
- 15% Final Exam

Appropriate Attire: This applies to all hospital visits and tours.

For women, slacks or skirts below the knees, blouses and shirts are acceptable.

For the men, slacks or khakis with polo or other dress collar shirt.

No sandals, tennis shoes, jeans, cargo or athletic pants or t-shirts.

The general rule is to dress with respect.

If you have any questions, speak to me the day before the trip.

FY 180 SYLLABUS

	Week 1: History of Science in Medicine	
Day 1 Monday, April 25	9:00 – 10:30 Class Introduction and Overview	Assignment Due Purchase books Blood and Guts Complications How We Die
Day 2 Tuesday, April 26	9:00 – 12:00 Lecture History of Malaria Discussion History of Medicine Disease Doctoring Anatomy	Blood and Guts Pages 1-74
Wednesday, April 27 CC Cabin	9:00 – 12:00 Lecture Wilderness Medicine Discussion History of Medicine Lab Medicine Therapies Surgery 1:00 Depart for CC Cabin	Blood and Guts Pages 75 – 135
Thursday, April 28	9:00 – 12:00 Discussion History of Medicine The Hospital Modern Medicine and Science Practical Skills Wilderness Medicine 2:00 Return from CC Cabin	Blood and Guts Page 136 - 153
Friday, April 29	9:00 – 12:00 Student Presentations History of Medicine	Paper I due

	Week 2: Science and the Art of Medicine	
Monday, May 2	9:00 – 12:00 Discuss Complications: Fallibility Introduction Education of a Knife The Computer and the Hernia Factory When Doctors Make Mistakes Lecture Patient Safety: How can we provide good care knowing that we will make mistakes?	Complications Pages 1 – 74
Tuesday, May 3	9:00 – 12:00 Discuss Complications: Mystery The Pain Perplex A Queasy Feeling Crimson Tide The Man Who Couldn't Stop Eating Lecture: Bariatric Surgery Experiment Pain threshold 6:00 – 9:30 CPR class: group Q	Complications Pages 115 – 183 Choose topic Paper II
Wednesday, May 4	9:00 – 12:00 Discuss Complications: Uncertainty Final Cut Dead Baby Mystery Whose Body is it Anyway? The Case of the Red Leg Lecture Electrophysiology	Complications Pages 187 – 252 EKG Worksheets
Thursday, May 5	9:00 – 12:00 Trip EKGs with Dr. Rooks at Penrose Hospital	
Friday, May 6	9:00 – 12:00 Student Presentation Complementary and Alternative Medicine	Paper II due

	Week 3: Applications of Science in Medicine	
Monday, May 9	9:00 – 12:00 Discuss How We Die The Strangled Heart A Valentine – How It Fails Doors to Death of the Aged Lecture Scientific Method Study design Biostatistics	How We Die 3 – 42, 64 – 88 Article Summary Choose topic Paper III
Tuesday, May 10	9:00 – 12:00 Discuss How We Die Alzheimer's Disease Murder and Serenity Lecture Scientific method Evidence based medicine Critical analysis Practical Skills Suturing 6:00 – 9:00 CPR class: group T	How We Die 89 – 139 Article Abstract Suturing Handout
Wednesday, May 11	9:00 – 5:00 Trip to Denver Visible Human Project Tour new UCHSC medical campus at Fitzsimmons Discussion with current medical students and residents	Paper III due Choose topic Paper IV
Thursday, May 12	9:00 – 12:00 Discuss How We Die Accidents, Suicide and Euthanasia Terri Schiavo case Practical Skills Suturing	How We Die 140 – 162 Terri Schiavo Article
Friday, May 13	9:00 – 12:00 Discuss How We Die A Story of Aids The Life of a Virus and the Death of a Man Lecture HIV/AIDS	How We Die 163 – 201

	Week 4: Medical Ethics	
Monday, May 16	9:00 – 12:00 Student Presentations Critical Analysis of Health Claims Lecture Diagnostic Radiology	Paper IV due
Tuesday, May 17	9:00 – 12:30 Trip Memorial Hospital Laboratory Medicine Diagnostic Radiology	
Wednesday, May 18	9:00 – 11:00 Final Exam Discussion How We Die Video	

Careers in Health Care	Complimentary and Alternative Medicine
Advance Practice Registered Nurse	Acupuncture
Biostatistician	Alphabiotics
Cardiology Tech EEG Tech	Aromatherapy
Chiropractor	Aura therapy
Counselor	Ayurvedic medicine
Dental Hygienist	Chelation
Dentist	Chiropractic medicine
Dietitian (Nutritionist)	Craniosacral therapy
EKG Tech Lab Medicine Tech	Crystal therapy
Emergency Department Technician	Dietary supplements
Emergency Medical Technician	Ear candling
Epidemiologist	Electromagnetic fields
Massage Therapist	Energy therapy
Medical Social Worker	Homeopathy
Medical Statistician	Hypnosis
Occupational Therapist	Kinesiology
Operating Room Technician	Leeches
Optometrist	Macrobiotics
Paramedic	Maggot therapy
Pharmacist Pharmacy Tech	Magnet therapy
Phlebotomist	Massage therapy
Physical Therapist	Naturopathic medicine
Physician Assistant	Osteopathic medicine
Psychologist	Psychic therapy
Radiology Technician	Qi gong
Registered Medical Technologist	Reflexology
Registered Nurse	Reiki
Respiratory Therapist	Rolfing
Speech Pathologist	Shark cartilage
	Therapeutic touch
	Traditional Chinese medicine
	Urine therapy
	Yoga

Note: These lists are not meant to be exhaustive. If you think of another career path or alternative therapy that you would like to investigate, please contact me.

DEFINITIONS

- Absolute risk reduction (risk difference) – the amount the absolute risk is reduced
- Allopathic medicine – therapy with remedies that produce effects differing from those of the disease treated
- Association – a state in which two attributes occur together either more or less than would be expected by chance
- Bias – a factor that produces results which depart from the true values in a consistent direction
- Cause – an agent or condition that permits the occurrence of an effect or leads to a result
- Case-control study – a study where a group with disease are identified and a group without disease are used as controls for comparison
- Cohort study – a study of a group with individuals with and without a particular experience, exposure, or characteristic to observe the different rates of disease occurrence
- Confidence interval, 95% – the interval over which one can be 95% confident the true value is found
- Disease – a harmful deviation of normal function of any body part, organ, or system that is characterized by at least two of the following: recognized etiologic agents, identifiable group of signs or symptoms, and consistent anatomical alteration.
- Disorder – a derangement or abnormality of function, structure, or both, resulting from an unknown etiology but may include genetic or embryologic failure in development or from exogenous factors such as poison, trauma, or disease
- Effectiveness – the extent to which a treatment produces a beneficial effect when implemented under the usual conditions of clinical care
- Efficacy – the extent to which a treatment produces a beneficial effect under ideal conditions of an investigation
- Etiology – 1) the science dealing with causes of disease; 2) assignment of a cause, an origin, or a reason for something
- False negative – an individual with a negative test result but who actually has the disease as defined by the gold standard
- False positive – an individual with a positive test result but who actually does not have the disease as defined by the gold standard
- Fun – bombing down Captain Jacks on a sunny spring Colorado day.
- Gold standard – the criterion used to unequivocally define the presence and absence of a condition or disease
- Illness – 1) poor health; the experience of disease. 2) disease.
- Incidence – frequency of occurrence
- Medicine – 1) *modern*: the science of diagnosing, treating, or preventing disease and other damage to the body or mind, 2) *archaic*: the practice of curing illness

- Odds ratio – a ratio measuring the degree of association applicable to all types of studies using nominal data but usually applied to case-control and cross-sectional studies; the odds of having the risk factor if the condition is present divided by the odds of having the risk factor if the condition is not present
- P value – the probability of obtaining data at least as extreme as the data obtained if there were no true difference (true null hypothesis)
- Placebo – an inert substance given for psychological effect to satisfy the patient
- Predictive value of a negative test – the proportion of individuals with a negative test who do not have the condition as defined by the gold standard
- Predictive value of a positive test – the proportion of individuals with a positive test who actually have the condition as defined by the gold standard
- Prevalence – the total number of cases of a disease in a given population at a specific time
- Prognosis – a prediction of the probable course and outcome of a disease.
- Randomized clinical trial – an investigation where patients are assigned to study and control groups by a process of randomization
- Relative risk – a ratio of the probability of developing the outcome with the risk factor present divided by the probability of developing the outcome if the risk factor is not present.
- Relative risk reduction – the relative amount by which the risk is reduced
- Science – the observation, identification, description, experimental investigation, and theoretical explanation of phenomena.
- Scientific method – the totality of principles and processes regarded as characteristic of or necessary for scientific investigation, generally taken to include rules for concept formation, conduct of observations and experiments, and validation of hypothesis by observation or experiments
- Sensitivity – the probability that a person having a disease will be correctly identified by a clinical test; equal to the number of people with disease identified as having disease divided by the total number of people with disease
- Specificity – the probability that a person who does not have a disease will be correctly identified by a clinical test; equal to the number of people without disease identified as being without disease divided by the total number without disease
- Sign – objective evidence of disease, ie that perceived by examining physician
- Symptom – any subjective evidence of disease or of a patient's condition as perceived by patient; does not necessarily implicate an underlying problem or physical etiology
- Syndrome – a complex of symptoms indicating the existence of an undesirable condition or quality
- True negative – an individual who does not have the condition as defined by the gold standard, and has a negative test result
- True positive – an individual who has the condition as defined by the gold standard, and has a positive test result