

Critical Thinking in Medical Research – BIOM*6400

Course Syllabus and Outline

Department of Biomedical Sciences

SYNOPSIS

Most published clinical trials contain errors, and few health care professionals can detect anything more than the most basic flaws, yet improving scientific literacy appears to be of low importance to students, educators, and practitioners in the health professions. In other words, the health professions seem to accept the fact that their members often misinterpret their own literature. The good news is that you don't need to be a statistician or epidemiologist to be able to detect many of the common errors in the medical literature. By the end of this course, you will have markedly improved your ability to distinguish the good from the bad.

Even when good scientific evidence has been identified, it is not necessarily used to guide clinical decisions; the information may not be considered at all, or flawed reasoning may enter into the decision-making process. We will explore errors of reasoning that are so well recognized that they have been given names. We will also look at some of the reasons that we are prone to such errors, so we can try to avoid making them.

We will also discuss selected issues related to professional integrity and ethics.

INSTRUCTORS

WJ Brad Hanna, DVM, PhD

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Office hours: By appointment

Guest speakers to be announced

COURSE STRUCTURE

Lectures

Monday & Wednesday 3:30-4:50 pm OVC Main Building room 3648

Fridays 1:30-2:20 pm LA 204

GRADUATE CALENDAR DESCRIPTION

This course will explore a variety of issues related to the scientific ideals and practical realities of research in the health sciences. Topics will include critical thinking, critical appraisal of the medical literature (with emphasis on clinical trials), the principles of evidence-based medicine, and selected issues related to scientific integrity.

LEARNING OUTCOMES

This course is divided into three units. Specific Learning Outcomes by Unit:

Unit 1: Logic & Reasoning

By the end of this unit, students will be able to:

- a) critically evaluate arguments according to five key criteria, and develop good arguments
- b) recognize common errors of logic and tactics for avoiding a good argument
- c) evaluate potential causes of errors of reasoning with respect to the heuristics and biases associated with our 'autonomic decision maker' (Kahneman's *System 1*)

Unit 2: Critical Appraisal, the CONSORT Statement, GRADE assessment

By the end of this unit, students will be able to:

- a) assess the quality of reporting of clinical trials at an intermediate level, based on CONSORT and/or ARRIVE guidelines
- b) understand the differences between a clinical trial, a systematic review, and a body of evidence, and appreciate their interrelationships
- c) assess a body of evidence using the GRADE method, at an introductory level
- d) justify selected scientific procedures for the avoidance of bias
- e) recognize common ways in which medical research data can be misrepresented in a scientific publication

Unit 3: Scientific Integrity & Professionalism

By the end of this unit, students will:

- a) develop informed opinions about ethical issues related to health sciences research, such as plagiarism, fabrication of data, selective citation of the literature, authorship, peer review, conflict of interest, etc.
- b) be able to analyze the ethics of medical claims and beliefs using the criteria of WK Clifford

LEARNING RESOURCES

Unit 1

Required: Thinking, Fast and Slow. D Kahneman, Anchor Canada, 2013. Available on Ares course reserve.

Optional: Attacking Faulty Reasoning (5th edition), TE Damer, Thomson-Wadsworth, 2005 (better than the 6th edition)

Unit 2

The CONSORT Statement 2010 Checklist:

<http://www.consort-statement.org/checklists/view/32-consort/66-title>

The CONSORT Statement 2010 Elaboration Document:

<http://www.consort-statement.org/downloads/consort-statement>

The GRADE approach for assessing the quality of evidence:

<http://training.cochrane.org/path/grade-approach-evaluating-quality-evidence-pathway>

METHODS OF ASSESSMENT <i>(Subject to change with notice on Courselink)</i>

Form of Assessment	Weight	Due Date	Course Content /Activity	Learning Outcomes Addressed
On-line quizzes	8%	Sep/Oct	Logical fallacies, heuristics & biases	1b, c
Group fallacy assignment	12%	Sep/Oct	Argument assessment & infographic	1a, b
Group heuristics & biases assignment	15%	Sep +/-or Oct	Synopsis of one chapter from Parts 2, 3, or 4 of Kahneman & infographic	
Group presentations	25%	Oct/Nov	GRADE assessment	2b, c, d, e
Group critiques	5%	Oct/Nov	Clinical trial quality assessment	2a, b
Final examination	35%	Scheduled by the Registrar	Comprehensive	All

Notes on assessments**Final Examination**

The final examination will cover all course material. The format will be short-answer and point form.

On-Line Quizzes

Quizzes are formative assessments intended to help students monitor their understanding of the material as the course progresses. You are encouraged to complete these well in advance of the deadline as **no extensions will be granted for technical reasons.**

Computer and network problems may occur at any time, so if you leave a quiz until the last minute you take the risk that you will be unable to complete it by the deadline.

Late Assignments

In the absence of documented extenuating circumstances (medical or compassionate), late submissions will be penalized 10% per day.

TEACHING METHODS

Lectures

Some standard lectures will be given. Other classes will take the form of a discussion of short readings that will be posted on D2L a couple of days in advance.

Seminar Presentations

Student groups will be presenting seminars during our Friday classes, mainly in November, and the material will be testable. Notes will be provided shortly after these seminars. The audience will consist of those enrolled in BIOM*6400 and BIOM*3210.

COURSE POLICIES AND PROCEDURES

Attendance

Participation in classroom discussions will help to prepare students for the assessments. Substantial issues that are discussed in class may be examined and will not necessarily be captured in the posted material, so if you are absent from a class you should ask a classmate for notes.

Accommodations for Students with Disabilities

The University of Guelph accommodates students with disabilities who have registered with Student Accessibility Services (SAS; formerly the Centre for Students with Disabilities). Students who require assistance from SAS must register with the centre (preferably within the first week of class) to verify their eligibility for accommodation, and contact the course coordinator at the beginning of the semester to discuss their specific needs. To schedule a registration appointment with a disability advisor, call the centre at 519-824-4120 x56208 or contact SAS by e-mail (refer to the CSD/SAS website).

Academic Consideration for Missed Assignments

If you are unable to meet a course deadline for medical or compassionate reasons, please review the regulations on academic consideration in the Undergraduate Calendar and discuss your situation with the course coordinator and/or program counsellor.

If the final exam is missed, application for a deferred exam must be made through your program counselor and the office of the Registrar as outlined in the Academic Consideration and Appeals section of the Undergraduate Calendar. Please see the calendar for more information.

Recording of Classes

Presentations which are made in relation to course work—including lectures—may not be recorded in any electronic format without the permission of the presenter, whether the instructor, a classmate or guest lecturer. When permission is granted, the material is not to be disseminated and is to be deleted at the end of the semester.

E-mail Communication

As per university regulations, all students should check their “uoguelph.ca” e-mail account regularly; e-mail is the official route of communication between the University and its students.

Drop Date

The last date to drop this course, without academic penalty, is the 40th class day. Consult the Schedule of Dates in the Undergraduate Calendar for this date.

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and enjoins all members of the University community – faculty, students, and staff – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. The University of Guelph takes a serious view of academic misconduct and it is your responsibility as a student to be aware of, and to abide by, the University’s policy. Included in the definition of academic misconduct are such activities as cheating, plagiarism, misrepresentation, and submitting the same material in two different courses without written permission. To better understand your responsibilities, students are expected to read the section on Academic Misconduct in the Undergraduate Calendar and academic integrity policies online:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

<http://www.academicintegrity.uoguelph.ca>

Students must also be aware that faculty have the right to use software to aid in the detection of plagiarism or copying and to examine students orally on submitted work. For students found guilty of academic misconduct, serious penalties including possible suspension or expulsion from the University of Guelph may be imposed.

Note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.