



BIOM*6400 Critical Thinking in Medical Research

Fall 2022

Section(s): C01

Department of Biomedical Sciences

Credit Weight: 0.50

Version 1.00 - August 20, 2022

1 Course Details

1.1 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 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. Offered in conjunction with BIOM*3210 and BIOM*4210. Extra work is required for graduate students.

Restrictions: Instructor consent required. Credit may be obtained for only one of BIOM*3210, BIOM*4210 or BIOM*6400

1.2 Course Description

Randomized controlled trials (RCTs) and syntheses thereof are considered to be the highest-quality forms of medical evidence for determining efficacy. Quality assessments of published RCTs, however, show that descriptions of key items are often vague or incomplete and that many common procedures are performed incorrectly.

For example, the conclusions of an RCT can be fundamentally altered by either including, or excluding from the analysis, those who dropped out of the study part way through, yet fewer than half of published RCTs clearly and accurately describe which type of analysis they performed.

Internationally recognized standards have been developed to improve the design and reporting of RCTs (e.g. ICH Efficacy Guidelines, CONSORT Statement), and overall

quality is improving, but progress is slow. For example, RCTs published in four elite medical journals in 2015 did not do a better job of describing how allocation concealment was achieved than studies published prior to 2002.

With evidence showing that the medical literature is not as reliable as many assume, it is therefore important that the graduates of health-related programs be equipped with skills to assess its quality prior to incorporating its findings into their research or clinical practice.

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, however, 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.

1.3 Timetable

TUES & THURS 2:30-3:50 pm, OVC ECLA room 3708

Timetable is subject to change. Please see WebAdvisor for the latest information.

1.4 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructional Support Team

Course Co-ordinator: W J Brad Hanna BSc, DVM, MSc, PhD
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Office: OVC 1646D

3 Learning Resources

3.1 Required Resources

Thinking, Fast and Slow (Textbook)

Thinking, Fast and Slow. D Kahneman, Anchor Canada, 2013.

4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. *By the end of this course, 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*)
- d. assess the quality of reporting of clinical trials at an intermediate level, based on CONSORT and/or ARRIVE guidelines
- e. understand the differences between a clinical trial, a systematic review, and a body of evidence, and appreciate their interrelationships
- f. assess the quality of a body of evidence using the GRADE method, at an introductory level
- g. justify selected scientific procedures for the avoidance of bias
- h. recognize common ways in which medical research data can be misrepresented in a scientific publication
- i. 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.
- j. be able to analyze the ethics of medical claims and beliefs using the criteria of WK Clifford
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5 Teaching and Learning Activities

Lecture discussions, group and individual assignments, and group presentations.

6 Assessments

Individual and group work: 65%

Final short-answer exam: 35%

6.1 Marking Schemes & Distributions

7 Course Statements

7.1 Late assignments

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

8 University Statements

8.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

8.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

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

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

8.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

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

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

8.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

8.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

For Guelph students, information can be found on the SAS website
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website
<https://www.ridgetownc.com/services/accessibilityservices.cfm>

8.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please 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.

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

Graduate Calendar - Academic Misconduct
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

8.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

8.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
<https://www.uoguelph.ca/academics/calendars>

8.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

8.10 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).

8.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campus/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campus/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.
