ICR The Institute of Cancer Research

MSc in Oncology

Including PG Certificate and PG Diploma

Statistics for the Oncologist

Module Guide 2019/20

Part A | Basic Sciences

UNIVERSITY OF LONDON

Contents

Guide last amended: 11/01/2019

1 Module details

1.1 Module overview

This module is designed to help you understand the fundamental statistical principles used in the assessment of cancer epidemiology and treatment. Taking part in this module will support you in developing the valuable skills used in implementing and assessing new treatments, and will help you learn to critically appraise published papers.

The module is compulsory and is taken in Part A of the course. Lectures take place over five weeks during the first semester, and assessment takes place at the end of the module.

1.2 Module specification

Statistics for the Oncologist	
Full Title:	Statistics for the Oncologist
Part of Course:	Part A: Basic Sciences
Compulsory or optional:	Compulsory
ICR Reference Number:	MS1002
Academic Level:	Level 7 (Masters)
Credit Value:	10 Credits

2 Contact information

2.1 General enquires

Students are advised to contact the MSc course team regarding any administrative matters at *mscadministrator@icr.ac.uk*. Any academic matters should be forwarded to the Course Director, Module Leaders or Lecturers as appropriate.

2.2 Key people

Name	Contact Information
Course Director	
Dr Rema Jyothirmayi Consultant Clinical Oncologist, ICR/RMH	*rema.jyo@nhs.net*
Module Leaders	
Mrs Lucy Kilburn Senior Medical Statistician, ICR Clinical Trials and Statistics Unit (ICR-CTSU), ICR	*lucy.kilburn@icr.ac.uk*
Mrs Clare Griffin Medical statistician, ICR Clinical Trials and Statistics Unit (ICR-CTSU), ICR	*clare.griffing@icr.ac.uk*

3 Module structure and aims

3.1 Aims

This module aims to give you the tools to understand the statistical principles underlying the assessment of cancer epidemiology and treatment. You will develop the necessary skills required to participate in - and evaluate – the design of new treatments, and to critically appraise published papers.

3.2 Learning objectives

This module will allow students to:

- Develop systematic, advanced skills in the description, display and comparison of sets of data;
- Apply appropriate statistical tests to different types of data;
- Gain a systematic understanding of trends in cancer development and how putative aetiological factors are assessed by epidemiologists;
- Critically appraise the design, organisation and results of cancer clinical trials.

3.3 Structure

This module is a core module for Part A of the Postgraduate Certificate / Postgraduate Diploma / MSc in Oncology course. Students should attend all lectures to prepare themselves for the end of module assessments.

For this module, students will prepare a critical review of a journal article for the summative assessment.

A full and up to date module timetable, including dates for the presentation sessions, is available in the calendar on Canvas. Any changes to this schedule will be announced through Canvas notifications.

4 Syllabus content

4.1 Core syllabus content

The module is split into eight topics. The key subjects covered in each are:

- Types of data
  - presenting and summarising individual variables;
  - categorical data (nominal, ordinal);
  - numerical data (discrete and continuous, the Normal distribution, transformation to Normality);
  - bar charts and histograms;
  - measures of central tendency and spread.
- Sampling
  - concept of a source population;
  - random sampling;
  - estimation of population statistics;
  - standard error of a sample mean and of a proportion, and their differences, confidence intervals, reference ranges.
- Principles of statistical inference
  - hypothesis testing and estimation;
  - type I and II errors;
  - interpretation of p-values and confidence intervals;
  - statistical and clinical significance.
- Comparing two or more groups
  - t-tests;
  - chi squared (with or without corrections).
- Measures and tests of association between variables
  - correlation and regression;
  - scatter plots;
  - screening tests;
  - sensitivity;
  - specificity;
  - positive and negative predictive value.

- Survival analysis
  - types of time-to-event data (survival data, recurrence data);
  - presentation of survival data;
  - Kaplan-Meier and actuarial survival curves;
  - summarising survival data;
  - comparing groups;
  - logrank test for two or more groups, including ordered groups;
  - use of Cox's proportional hazards regression model;
  - hazard ratios and their interpretation.
- Clinical trials
  - phases I-IV of clinical trials;
  - randomisation (need for randomisation, problems with non-randomised studies and historical controls, methods of randomisation (simple, block, stratified minimisation), blinding/masking);
  - designs (parallel group, cross-over, factorial);
  - contents of a trial protocol;
  - ethics and informed consent;
  - measures of response (tumour regression, quality of life, morbidity, local and regional recurrence, distant metastases, death);
  - principles of sample size calculation, interim analyses, intention-to-treat analysis;
  - role and basic principles of meta-analysis.
- Epidemiology
  - design and interpretation of retrospective (case control) and prospective (cohort) studies;
  - odds ratios and relative risks;
  - mortality rates and standardised mortality rates;
  - cancer registration and follow-up;
  - Trends in cancer incidence and mortality for major cancers.

5 Assessment

5.1 Assessment overview

Both formative and summative assessment methods will be used in this module. All students must complete both types of assignment. Please refer to the Assessment section on Canvas or in the Student Handbook for more guidance on more general aspects of assignment submission.

5.2 Formative single best answer test

For this module, all students will sit a compulsory single best answer (SBA) test. This SBA must be passed in order to pass the module overall, but the score will not contribute to the overall module mark.

The test is taken on Canvas and will consist of 25 questions, each scoring 10 points. You must score at least 50% (130 points) to pass. You have two attempts at this test and your highest score will be recorded. The SBA must be completed within 45 minutes.

5.3 Summative assignment

This module is assessed via a ‘critical review’ essay of **strictly up to 1,200 words.**

For this coursework, you will select a journal article to critically review and then use the associated tool kit provided to help you critique it. This will allow you to explore and examine the depth of your understanding of a specific aspect of statistics, along with your ability to critically appraise data and demonstrate its relationship and relevance to a clinical environment.

The critical review must be based on one of a selection of eight published research papers which will be provided to students

during the module. You will sign up to your paper of choice via Canvas by 'joining' the appropriate group for the paper you have selected. A maximum of six students (depending on class numbers) will be able to review each paper on a first-come-first-served basis. You will be randomly assigned to a paper/group if you do not make this selection before the deadline.

You should use the structured appraisal guidelines in the respective tool kit to critique the paper (this can be for a randomised controlled trial, systematic review, qualitative, or cohort, case control or diagnostic studies). Further advice on how to critique the papers will also be given during the course.

Your critical review of the paper should include:

- A brief (not exceeding 200 words) description of the trial design and main findings;
- A critical appraisal of the quality of the paper according to the criteria as highlighted in the appropriate tool kit
- Conclusions from the paper (not exceeding 200 words).including:
    - How the findings of the trial relate to the standard management of patients with this condition;
    - Whether the trial should change patient management, and how;
    - Any limitations to implementing change on the basis of the trial;
    - Future research this trial could stimulate, suggesting an appropriate design if possible.

You can use the headings of the appropriate critical appraisal toolkit to structure your essay if you wish. However, please note that it should be written in prose and not a list of bullet points or questions and answers.

Submit your essay via Canvas following the instructions in the Student Handbook. Ensure you submit the same essay to both

markers. **Remember that penalties will apply for any work that is late, over the word limit, or includes plagiarised material.**

Group discussion

A group discussion session will be held prior to submitting the assignment. For this session, you should have read your chosen paper and completed the appraisal tool kit questions for that paper. In addition, you should have read all the other papers on the list but you do not need to complete an appraisal tool kit for these. For the first half of the session you will be sat in groups according to your chosen paper. You will discuss the paper amongst yourselves and seek advice from the module leaders. For the second half of the session you will be in mixed groups with approximately one student per paper within a group. You will then briefly summarise your chosen paper to the rest of the group and lead a discussion around the positive and negative aspects of your paper. You do not have to have written your essay by the date of the group discussion, only notes. You should take on board the comments made during this session and use these to refine your essay before submission.

6 Learning resources

6.1 Learning resources

The following learning resources are relevant to this module:

Core texts

You are strongly advised to read the following key papers:

- An Introduction to Medical Statistics, 3rd edition. Bland. (2000) Oxford University Press
- Epidemiology for the Uninitiated, 5th edition. Coggon, Barker, Rose. (2003) BMJ Books
- Medical Statistics at a Glance. Petrie, Sabin. (2000) Blackwell Science
- Practical Statistics for Medical Research. Altman. (1990) Chapman & Hall
- Statistical Questions in Evidence-based Medicine. Bland, Peacock. (2000) Oxford University Press

Additional reading

Students are encouraged to read these papers:

- Clinical Epidemiology: A Basic Science for Clinical Medicine, 2nd edition. Sackett, Haynes, Tugwell. (1991) Lippincott Williams & Watkins
- Clinical Trials in Cancer: Principles and Practice. Girling, Parmar, Stenning, Stephens. (2003) Oxford University Press

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