1.6 Science in practice: Applying research for clinicians
Course outline

Chapter 1: Introduction
Keys to an evidence-based clinical practice

Medical research is not as terrifying as it seems. Witness the impressive evolution of research, fuelled by the need to optimise clinical practice. This chapter sets the stage for a course that will make you a better clinician – guaranteed!

Chapter 2: Find answers to your questions
Simple tips to navigate the literature and help your patients

Scientific databases can be intimidating. This chapter shows how to build the best research strategy, and find the answers to the needs of your patients. A simple process that will save you a lot of time.

Chapter 3: Read like an expert
Know your way around an article, and which journals can be trusted

It is not easy to find what you are looking for, when reading a scientific article. This chapter presents the key elements that will allow you to identify and understand the information you seek. It is so much easier to navigate the literature when you know how to recognise which journals can be trusted, and how to read an article.

Chapter 4: Understand the evidence
Identify the best studies, and rely on the levels of evidence

Among so many published studies, which ones should you prioritise? This chapter presents the different study designs and levels of evidence. You will learn how to use the most appropriate studies for your needs, which will improve your clinical results and the satisfaction of your patients.

Chapter 5: Avoid the traps
Determine the validity of a study, and whether it applies to your situation

How do you know if a study deserves your attention? This chapter introduces the concept of validity, which will help you avoid common pitfalls in science. Your new, sharpened critical thinking skills will allow you to develop a solid intellectual self-defence approach, and to sort out the studies that will really guide your clinical approach.

Chapter 6: Differentiate between association, correlation and causation

Learn how different studies can help you in different ways

It is not always easy to understand how different factors interact in the medical field. This chapter sheds light on the key differences between prospective and cross-sectional studies, and highlights how each design can contribute to improving your clinical practice. No more confusion!

Chapter 7: Make the right diagnosis

Identify the best tests to better orientate your treatments

There are so many tests that it can become difficult to navigate. This chapter shows how to choose which ones will effectively determine the source of pain in your patients, and which ones should be left out. With a better diagnostic reasoning, your treatment approach will certainly gain in efficiency.

Chapter 8: Find the best treatment

Your patients deserve it

The amount of treatment options can be overwhelming. After this chapter, you will be able to identify which treatments to prioritise, and whether a new approach is actually beneficial, or rather misleading. Optimise your clinical approach, and your patients will thank you.

Chapter 9: Monitor progress in your patients

Determine if your treatment approach is on the right track

Which measuring tools should you choose, and how should you use them? This chapter allows you to target the best questionnaires and instruments to monitor the progress of your patients. With the right measuring tools, you will know if your treatment approach is on the right track.

Chapter 10: Review the literature

See the forest for the trees

Literature reviews can seem very complex. This chapter explains, in a detailed yet simplified way, everything you need to know when you read literature reviews. Mastering literature reviews will give you an overview of the state of research so much faster.

Chapter 11: Get involved in research

Contribute to better care

Getting involved in the research process is not as complex as one might think. This chapter will show you how, in a few simple steps, you can contribute to scientific research as a clinician, and even get your research published. Such an experience will make you an even stronger clinician!

Objectives and main elements of the course

Chapter 1: Introduction

Objective

- Understand the basic history and purpose of medical research and the fundamental principles of an evidence-based clinical practice

Main elements

- Landmark studies in the history and evolution of medical research
- Fundamental principles of an evidence-based clinical practice
- Importance of ethics in clinical research

Chapter 2: Find answers to your questions

Objectives

- Understand what information is necessary to search the literature
- Design a Population-Intervention-Comparison-Outcome (PICO) question and a search strategy in PubMed
- Apply a search strategy to a clinical situation

Main elements

- PICO questions for diagnosis, treatment and follow-up situations
- Main search databases: PubMed, Embase, Cochrane, Pedro, CINAHL, SportDiscus, Google Scholar
- Search strategies, keywords and boolean operators (e.g. AND/OR/NOT/*) and combining complementary searches
- Tools to access the full-text version of scientific articles (e.g. PubMed, ResearchGate, Unpaywall)

Chapter 3: Read like an expert

Objectives

- Understand the structure and main components of a scientific article
- Know the main steps of the peer-review process
- Differentiate reputable and predatory journals

Main elements

- Structure of a scientific article: introduction, objectives, hypotheses, methods (inclusion and exclusion criteria, ethics, procedures, statistical analyses), results, discussion, conclusion, supplemental material, tables, figures, graphs
- Methods to identify which journals can be trusted, and to avoid predatory journals

Chapter 4: Understand the evidence

Objectives

- Master the different levels of evidence in medical research
- Interpret results from multiple study designs, and differentiate how they inform clinical practice
- Understand which behaviours should be preferred for optimal critical thinking about evidence

Main elements

- Oxford levels of evidence 1-5, with examples of different articles: expert opinion (editorial or viewpoint), case study, case series, randomised controlled trial, systematic review with or without meta-analysis, consensus statement
- Differences between experimental designs: qualitative, quantitative, cross-sectional, cohort, prospective, retrospective, pilot and Delphi studies, and surveys

Chapter 5: Avoid the traps

Objective

- Assess the internal and external validity of a scientific article

Main elements

- Internal and external validity, and their respective utility
- Risk of bias
- Statistical and clinical significance, and their respective utility

Chapter 6: Differentiate between association, correlation and causation

Objectives

- Differentiate between causation and correlation
- Distinguish and understand the structure, content and implications of a cross-sectional study and a prospective study
- Explore measures of association between variables and their clinical implications by analysing a scientific article

Main elements

- Different relationships between variables, and measures of association or correlation: odds ratio, relative risk, risk ratio, survival analysis, correlation coefficient and confidence interval
- Factors that show an association, in a cross-sectional study
- Conditions to establish a causation, in a prospective study

Chapter 7: Make the right diagnosis

Objectives

- Understand what diagnostic tests are better based on their psychometric properties
- Elaborate a diagnostic clinical decision-making process based on different tests
- Understand the structure, content and implications of a diagnostic study by analysing a scientific article

Main elements

- Difference between validity and reliability, and their respective utility
- Difference between sensitivity and specificity, and their respective utility
- Main concepts used in studies on diagnostic tests: gold standard, agreement between assessors, intra- and inter-assessor reliability, Kappa coefficient, intra-class coefficient, sensitivity (SNOUT), specificity (SPIN), positive and negative likelihood ratios, positive and negative predictive values, and diagnostic clusters

Chapter 8: Find the best treatment

Objectives

- Understand the hierarchy of evidence for intervention studies, and the clinical implications of each design
- Know the elements of an intervention study that reduce its risk of bias
- Understand the structure, content and implications of a randomised controlled trial by analysing a scientific article

Main elements

- Pros and cons of case series, cohort studies and randomised controlled trials
- Benefits of randomisation and (single, double or triple) blinding
- Outcome measures of intervention studies: P value, confidence interval and effect size
- Main statistical measures of intervention studies: paired t test and analyses of variance (ANOVA) and covariance (ANCOVA)
- Main concepts used in intervention studies: CONSORT checklist, experimental and quasi-experimental study, blinding, dropout rate, post-hoc test, group, time and interaction effects, and pre-registration of protocol

Chapter 9: Monitor progress in your patients

Objectives

- Understand the importance of outcome measures, including patient-reported outcome measures
- Determine which outcome measures are better based on their psychometric properties
- Understand the structure, content and implications of a study on outcome measures by analysing a scientific article

Main elements

- Differences between validity, reliability and sensitivity to change, and their respective utility
- Main concepts used in studies on follow-up measures: criterion, (convergent or divergent) construct and predictive validity, intra-, inter-assessor and test-retest reliability, global rating of change, minimal detectable change and minimal clinically important difference

Chapter 10: Review the literature

Objectives

- Differentiate between the types of literature reviews, and their implications
- Understand the structure and content of a systematic review and meta-analysis by analysing a scientific article

Main elements

- Value of a literature review based on its methods
- Steps to conduct a systematic review
- Main concepts used in literature reviews: narrative and systematic reviews (including Cochrane), meta-analysis, network meta-analysis, pre-registration of protocol, search strategy, title and abstract screening, full-text screening, data extraction, PRISMA guidelines, risk of bias, strength of the evidence and forest plot

Chapter 11: Get involved in research

Objectives

- Learn different ways to get involved in research as a clinician
- Understand the research process, from the research idea to the dissemination of the results of the study

Main elements

- Various possible implications in research according to interest and free time
- Importance of appropriately measuring the scope of a research idea
- Main steps in planning and executing a study and disseminating its results
- Explanation of the Altmetric score