Title: Acquiring Medical Statistical Competencies in a Demanding Evidence-Based World: Thoughts and Experience from a Student Statistical Team in a Mexican Academic Center

Article type: Experience

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Acknowledgment: We thank the Research Department and the BP Invest Program for their support and research training during our undergraduate studies.

Financing: None.

Conflict of interest statement by authors: The authors have no conflicts of interest to declare that are relevant to the content of this article.

Compliance with ethical standards: Not applicable.

Authors Contribution Statement: Writing – Original Draft Preparation, Writing – Review & Editing: CCC, HLG, JMMA. Review & Editing: AJBG, BHVS, AGM, NAAV.

Manuscript word count: 755
Abstract word count: 61
Number of Figures and Tables: 2

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Discussion Points:
- Training and encouraging students to critically review the evidence and make evidence-based decisions should be one of the goals of medical education. #medstatistics #EBM #MedicalStudents
Dates
Submission: 07/19/2022
Revisions: 08/27/2022
Responses: 08/27/2022
Acceptance: 10/18/2022
Publication: 10/21/2022

Editors
Associate Editor/Editor: Francisco J. Bonilla-Escobar
Student Editors: Benjamin Liu, Alisha Poppen & Lorraine Arabang Sebopelo
Copyeditor:
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Training and encouraging students to critically review the evidence and make evidence-based decisions should be one of the goals of medical education. We report our experience developing an extracurricular university student statistical team that offer statistical aid to other students and faculty. This includes supervised training sessions and mentoring in diverse scientific research fields performed in our university.

Key Words: Medical Student; Statistics; Education; Personal Narrative.
THE EXPERIENCE

In an era of constant emergence of advanced scientific knowledge, keeping up can be overwhelming for many physicians, especially for medical students and residents who must leap into the race and learn to maneuver through the vast amount of evidence available. Due to this, training and encouraging students to critically review the evidence and make evidence-based decisions should be one of the goals of medical education.\(^1\) Learning statistics and epidemiology is important for physicians as it is expected for them to be able to make decisions according to what is best for the patient, with the best possible evidence available. Having such competence will enable future physicians to contribute to critically reviewing articles and publishing.

The understanding of epidemiological and statistical principles is essential for the performance and critical appraisal of clinical research. However, many clinicians excel throughout various levels of training with poorly perceived knowledge of these concepts.\(^2\) Locally, biostatistics and epidemiology are integrated into the undergraduate (pre-clinical/clinical) curriculum, however, the delivery of the content is often inadequate. For instance, there is insufficient application of the knowledge, which we consider an area of opportunity that should be considered in our school. Although the importance of learning statistics has been established, there exists barriers to exploring this field. For example, there is a common fear that the course is too challenging and demanding.

To prove the generalized problem in teaching medical statistics at a national level, our team carried out a study in which most available study plans from medical schools across our country were reviewed. In this study, we found that less than half included at least one subject of medical statistics over the entire undergraduate course, independent from the requirements of the medical education national board accreditation.\(^3\) This was an important finding because the expectation is that physicians have reached a theoretical competence in this subject, since the national bachelor’s degree exit exam evaluates statistical and epidemiological concepts in its syllabus,\(^4\) thus showing the need to emphasize teaching epidemiology and statistical courses in undergraduate programs.

One of the greatest privileges of our medical school is the vast availability of professors who engage in research, thus providing ample guidance to students interested in the field. Students therefore have role models and are inspired to become academic physicians through participation in publishing, conferences and presentations. In essence, the authors of this work have become statistical enthusiasts with some level of expertise obtained after supervised training sessions and mentoring with real scientific work performed in our university. We have had the opportunity to aid in decision-making for research protocols being performed by other undergraduate and postgraduate students and professors who reached out to the statistical consultation services offered by our school (Figure 1).

To give readers context, some of the activities that we were able to perform during the statistical consultations were related to methodological advice personalized to each research protocol design, ideas for sampling and estimation of sample size, recommendations, and performance of statistical tests in accordance to the needs and objectives of each study, advising in the interpretation of results and design of graphs and tables,
presentations of medical statistics topics and even getting the opportunity to be involved in research works when there was the need for an additional collaborator (Figure 2). During the consultations, the petitioner usually comes at different phases of their project (from the idea, writing the protocol, processing data, statistical analysis, and final report for diffusion). Our task is to aid each fellow researcher adhere to research methodology, provide help in performing and interpreting statistical tests and give guidance in merging the components of their project.

Although teaching basic epidemiologic and statistical theory is essential for understanding more advanced practical notions, we recommend that these subjects consider adapting to more practical approaches and spend less time teaching impractical concepts such as manually calculating a standard deviation or performing frequency tables. We therefore believe that subjects related to these topics should invest more time in teaching students how to access to data, critically appraise the available evidence, design and complete a database, use statistical software for analyzing, interpreting, and contrasting data from other prior knowledge, and earn the competence to make inferences and conclusions from other studies aside to the authors’ criteria.

Although many of the activities in which we have been trained have been obtained on an extracurricular basis, many of these scenarios could be replicated in the classroom. From this perspective, each student can understand and agree on the need for the acquisition of these essential scientifical abilities for his/her clinical practice and possibly further activities related to work or achievement of a postgraduate degree.

To overcome these barriers, it is required for both medical education providers and students to acknowledge that there is an increasing need for physicians to be competent in delivering evidence-based decisions and that medical education must supply tools for addressing this demand. To address this issue, medical schools should consider obligatory and complete courses related to these subjects, as well as other elective courses that meet the needs of different student interests. For students who are interested in clinical statistics and research, we believe the best way to learn, at least in our setting, is to reach a fellow researcher who is actively engaged, who is willing to consider a mentoring relationship in the field you have most interest. Even though many medical students usually change in interests as they advance during their formation, the knowledge that they will obtain from these experiences can be applicable or adapted to other areas.
Entrenar y alentar a los estudiantes a revisar críticamente la evidencia y tomar decisiones basadas en evidencia debe ser una de las metas de la educación médica. Presentamos nuestra experiencia en el desarrollo de un equipo estadístico extracurricular de estudiantes universitarios que ofrece ayuda estadística a otros estudiantes de licenciatura y posgrado, y a profesores. Esto incluye sesiones de formación supervisadas y tutorías en diversos campos de la investigación científica realizadas en nuestra universidad.
REFERENCES.


During the COVID-19 pandemic, our statistics team continued training via Internet video meetings. One of the team members is giving a workshop (in Spanish) on statistical tests performed for comparing more than two groups, like the one-way ANOVA test.
Figure 2. Supervised statistical services offered in the consultations by the student statistical team in training.