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

Carlos de la Cruz-de la Cruz,[1,2] Humberto de León-Gutiérrez,[3] Juan Manuel Millán-Alanís,[4] Andrea Judith Bautista-Gómez,[5] Braulio Hernán Velasco-Sepúlveda,[6] Adrián González-Martínez,[1] Neri Alejandro Álvarez-Villalobos.[7]

Abstract

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 offers statistical aid to other students and faculty. This includes supervised training sessions and mentoring in diverse scientific research projects at work in our university.

Key Words: Medical Student; Statistics; Education; Personal Narrative (Source: MeSH-NLM).

The Experience

In an era of constant emergence of advanced scientific knowledge, staying up to date 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 information 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 also 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 their various levels of medical training with poorly perceived knowledge of these concepts.[2] At our institution, 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 included in our school's curriculum. 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 demonstrate this problem in teaching medical statistics at a national level in Mexico, our team carried out a study in which most available curriculums from medical schools across the country were reviewed. In this study, we found that less than half of the curriculums 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 academic expectation is that physicians have reached a theoretical competence in this subject upon graduation. The National Bachelor's Degree Exit Exam evaluates statistical and

1 MD. Department of Hematology, Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico.

2 Department of Internal Medicine, Christus Muguerza Hospital Alta Especialidad. Universidad de Monterrey. Monterrey, Mexico.

3 MD. Plataforma INVEST Medicina UANL-KER Unit Mayo Clinic (KER Unit Mexico). Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico.

4 MD. Department of Internal Medicine, Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico.

5 MD. Department of Dermatology, Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico.

6 MD. Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico. Institute of Ophthalmology Fundación Conde de Valenciana. Mexico City, Mexico.

7 MD, PhD. Plataforma INVEST Medicina UANL-KER Unit Mayo Clinic (KER Unit Mexico). Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico. Knowledge and Evaluation Research Unit, Mayo Clinic, Rochester, Minnesota, USA.

About the Author: *The authors are MD and researchers (Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico), pursuing a medical residency after recently graduating (AGM), currently in a residency training program (CCC, HLG, JMMA, AJBG, BHVS) or faculty senior researcher (NAAV).*

Correspondence:

Neri Alejandro Álvarez-Villalobos

Address: Av. Dr. José Eleuterio González 235, Mitras Centro, 64460 Monterrey, N.L., Mexico

Email: neri_alex@hotmail.com, villalobos.neri@mayo.edu

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epidemiological concepts in its syllabus,[4] thus emphasizing the need to teach 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, thereby 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*).

Figure 1. 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, such as the One-way ANOVA Test.
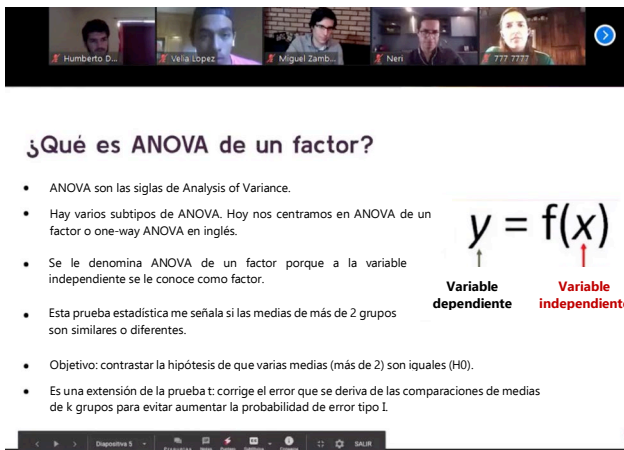

To give readers context, some of the activities that we were able to perform during the statistical consultations were related to methodological advice personalized to each research protocol design, ideas for sampling and estimation of sample size, performance of statistical tests in accordance to the 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 when there was a need for an additional collaborator (*Figure 2*). During the consultations, the petitioner usually came at different phases of their project (from the idea, writing the protocol, processing data, statistical analysis, and final report for diffusion). Our task was to aid each fellow researcher adhere to the 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 theories are essential for understanding more advanced practical notions, we recommend that these subjects include more practical approaches and therefore, spend less time teaching impractical concepts such as manually calculating a standard deviation or performing frequency tables. We believe that the subjects related to these topics should invest more time in teaching students how to access 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 from the authors' criteria.

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

Figure 2. Supervised Statistical Services Offered in the Consultations by the Student Statistical Team in Training.
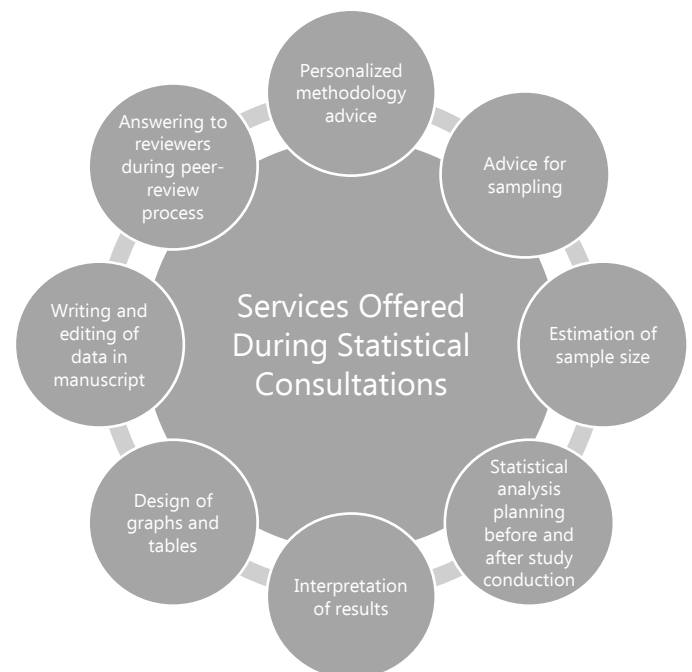
To overcome these barriers, it is required for both medical education providers and students to acknowledge that there is an increasing need for physicians to be competent in delivering evidence-based decisions and that medical education must supply tools for addressing this demand. To resolve this issue, 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 out to a

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fellow researcher who is actively engaged and willing to consider a mentoring relationship in the field you have most interest. Even though many medical students can change their fields of interests as they advance in medical school, the knowledge that they will obtain from these experiences can be universally applied to any field involved in clinical statistics and research. .

Summary – Accelerating Translation

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.

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