1 **Title:** Acquiring Medical Statistical Competencies in a Demanding Evidence-Based World: Thoughts and
2 Experience from a Student Statistical Team in a Mexican Academic Center
3
4 **Article type:** Experience
5

6 **Author names:**
7   1. Carlos de la Cruz-de la Cruz
8   2. Humberto de León-Gutiérrez
9   3. Juan Manuel Millán-Alanís
10   4. Andrea Judith Bautista-Gómez
11   5. Braulio Hernán Velasco-Sepúlveda
12   6. Adrián González-Martínez
13   7. Neri Alejandro Álvarez-Villalobos
14
15 **Degrees and Affiliations:**
16   1. MD. Department of Hematology, Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio
17   González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico
18   2. MD. Plataforma INVEST Medicina UANL-KER Unit Mayo Clinic (KER Unit Mexico). Facultad de
19   Medicina y Hospital Universitario "Dr. José Eleuterio González, Universidad Autónoma de Nuevo Léon,
20   Monterrey, Mexico
21   3. MD. Department of Internal Medicine, Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio
22   González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico
23   4. MD. Department of Dermatology, Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio
24   González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico
25   5. MD. Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio González, Universidad Autónoma
26   de Nuevo Léon, Monterrey, Mexico. Institute of Ophthalmology Fundación Conde de Valenciana.
27   Mexico City, Mexico.
28   6. MD. Department of Hematology, Facultad de Medicina y Hospital Universitario "Dr. José Eleuterio
29   González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico
30   7. MD, PhD. Plataforma INVEST Medicina UANL-KER Unit Mayo Clinic (KER Unit Mexico). Facultad de
31   Medicina y Hospital Universitario "Dr. José Eleuterio González, Universidad Autónoma de Nuevo Léon,
32   Monterrey, Mexico. Knowledge and Evaluation Research Unit, Mayo Clinic, Rochester, Minnesota, USA
33
34 **ORCID (Open Researcher and Contributor Identifier):**
35 https://orcid.org/0000-0002-6091-6374
36 https://orcid.org/0000-0003-2426-8776
37 https://orcid.org/0000-0001-5583-2582
38 https://orcid.org/0000-0002-6097-9877
39 https://orcid.org/0000-0002-1001-0873
40 https://orcid.org/0000-0002-1995-6593
41 https://orcid.org/0000-0001-5208-1429

1 **About the author:** The authors are MD and researchers (Facultad de Medicina y Hospital Universitario "Dr.
2 José Eleuterio González, Universidad Autónoma de Nuevo Léon, Monterrey, Mexico), pursuing a medical
3 residency after recently graduating (CCC, HLG, AGM), currently in a residency training program (JMMA, AJBG,
4 BHVS) or faculty senior researcher (NAAV).
5
6 **Corresponding author email:** neri_alex@hotmail.com, villalobos.neri@mayo.edu
7

11 **Conflict of interest statement by authors:** The authors have no conflicts of interest to declare that are relevant
12 to the content of this article.
13 **Compliance with ethical standards:** Not applicable.
14
15 **Authors Contribution Statement:** Writing – Original Draft Preparation, Writing – Review & Editing: CCC, HLG,
16 JMMA. Review & Editing: AJBG, BHVS, AGM, NAAV.
17
18 **Manuscript word count:** 755
19 **Abstract word count:** 61
20 **Number of Figures and Tables:** 2
21
22 **Personal, Professional, and Institutional Social Network accounts.**
23 - **Twitter:** @cadelacruzd, @brauliosepulved
24
25 **Discussion Points:**
26 - Training and encouraging students to critically review the evidence and make evidence-based decisions
27   should be one of the goals of medical education. #medstatistics #EBM #MedicalStudents
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1 **Dates**
2 Submission: 07/19/2022
3 Revisions: 08/27/2022
4 Responses: 08/27/2022
5 Acceptance: 10/18/2022
6 Publication: 10/21/2022
7
8 **Editors**
9 Associate Editor/Editor: Francisco J. Bonilla-Escobar
10 Student Editors: Benjamin Liu, Alisha Poppen & Lorraine Arabang Sebopelo
11 Copyeditor:
12 Proofreader:
13 Layout Editor:
14
15 **Publisher's Disclosure:** *This is a PDF file of an unedited manuscript that has been accepted for publication.*
16 *As a service to our readers and authors we are providing this early version of the manuscript. The manuscript*
17 *will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable*
18 *form. Please note that during the production process errors may be discovered which could affect the content,*
19 *and all legal disclaimers that apply to the journal pertain.*
20
21
22

1 **ABSTRACT.**

2

3 Training and encouraging students to critically review the evidence and make evidence-based decisions should be one

4 of the goals of medical education. We report our experience developing an extracurricular university student statistical

5 team that offer statistical aid to other students and faculty. This includes supervised training sessions and mentoring

6 in diverse scientific research fields performed in our university.

7

8 **Key Words**: *Medical Student; Statistics; Education; Personal Narrative.*

9

1 **THE EXPERIENCE**

2

3 In an era of constant emergence of advanced scientific knowledge, keeping up can be overwhelming for many

4 physicians, especially for medical students and residents who must leap into the race and learn to maneuver

5 through the vast amount of evidence available. Due to this, training and encouraging students to critically review

6 the evidence and make evidence-based decisions should be one of the goals of medical education.[1] Learning statistics

7 and epidemiology is important for physicians as it is expected for them to be able to make decisions according

8 to what is best for the patient, with the best possible evidence available. Having such competence will enable

9 future physicians contribute to critically reviewing articles and publishing.

10

11 The understanding of epidemiological and statistical principles is essential for the performance and critical

12 appraisal of clinical research. However, many clinicians excel throughout various levels of training with poorly

13 perceived knowledge of these concepts.[2] Locally, biostatistics and epidemiology are integrated into the

14 undergraduate (pre-clinical/clinical) curriculum, however, the delivery of the content is often inadequate. For

15 instance, there is insufficient application of the knowledge, which we consider an area of opportunity that should

16 be considered in our school. Although the importance of learning statistics has been established, there exists

17 barriers to exploring this field. For example, there is a common fear that the course is too challenging and

18 demanding.

19

20 To prove the generalized problem in teaching medical statistics at a national level, our team carried out a study

21 in which most available study plans from medical schools across our country were reviewed. In this study, we

22 found that less than half included at least one subject of medical statistics over the entire undergraduate course,

23 independent from the requirements of the medical education national board accreditation.[3] This was an

24 important finding because the expectation is that physicians have reached a theoretical competence in this

25 subject, since the national bachelor's degree exit exam evaluates statistical and epidemiological concepts in its

26 syllabus,[4] thus showing the need to emphasize teaching epidemiology and statistical courses in undergraduate

27 programs.

28

29 One of the greatest privileges of our medical school is the vast availability of professors who engage in research,

30 thus providing ample guidance to students interested in the field. Students therefore have role models and are

31 inspired to become academic physicians through participation in publishing, conferences and presentations. In

32 essence, the authors of this work have become statistical enthusiasts with some level of expertise obtained

33 after supervised training sessions and mentoring with real scientific work performed in our university. We have

34 had the opportunity to aid in decision-making for research protocols being performed by other undergraduate

35 and postgraduate students and professors who reached out to the statistical consultation services offered by

36 our school (**Figure 1**).

37

38 To give readers context, some of the activities that we were able to perform during the statistical consultations

39 were related to methodological advice personalized to each research protocol design, ideas for sampling and

40 estimation of sample size, recommendations, and performance of statistical tests in accordance to the needs

41 and objectives of each study, advising in the interpretation of results and design of graphs and tables,

1   presentations of medical statistics topics and even getting the opportunity to be involved in research works when
2   there was the need for an additional collaborator (**Figure 2**). During the consultations, the petitioner usually
3   comes at different phases of their project (from the idea, writing the protocol, processing data, statistical
4   analysis, and final report for diffusion). Our task is to aid each fellow researcher adhere to research
5   methodology, provide help in performing and interpreting statistical tests and give guidance in merging the
6   components of their project.
7
8   Although teaching basic epidemiologic and statistical theory is essential for understanding more advanced
9   practical notions, we recommend that these subjects consider adapting to more practical approaches and spend
10 less time teaching impractical concepts such as manually calculating a standard deviation or performing
11 frequency tables. We therefore believe that subjects related to these topics should invest more time in teaching
12 students how to access to data, critically appraise the available evidence, design and complete a database, use
13 statistical software for analyzing, interpreting, and contrasting data from other prior knowledge, and earn the
14 competence to make inferences and conclusions from other studies aside to the authors' criteria.
15
16 Although many of the activities in which we have been trained have been obtained on an extracurricular basis,
17 many of these scenarios could be replicated in the classroom. From this perspective, each student can
18 understand and agree on the need for the acquisition of these essential scientifical abilities for his/her clinical
19 practice and possibly further activities related to work or achievement of a postgraduate degree.
20
21 To overcome these barriers, it is required for both medical education providers and students to acknowledge
22 that there is an increasing need for physicians to be competent in delivering evidence-based decisions and that
23 medical education must supply tools for addressing this demand. To address this issue, medical schools should
24 consider obligatory and complete courses related to these subjects, as well as other elective courses that meet
25 the needs of different student interests. For students who are interested in clinical statistics and research, we
26 believe the best way to learn, at least in our setting, is to reach a fellow researcher who is actively engaged,
27 who is willing to consider a mentoring relationship in the field you have most interest. Even though many medical
28 students usually change in interests as they advance during their formation, the knowledge that they will obtain
29 from these experiences can be applicable or adapted to other areas.
30

1 **SUMMARY – ACCELERATING TRANSLATION.**

2

3 Entrenar y alentar a los estudiantes a revisar críticamente la evidencia y tomar decisiones basadas en evidencia

4 debe ser una de las metas de la educación médica. Presentamos nuestra experiencia en el desarrollo de un

5 equipo estadístico extracurricular de estudiantes universitarios que ofrece ayuda estadística a otros estudiantes

6 de licenciatura y posgrado, y a profesores. Esto incluye sesiones de formación supervisadas y tutorías en

7 diversos campos de la investigación científica realizadas en nuestra universidad.

1 **SUMMARY – ACCELERATING TRANSLATION.**

2

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1   **FIGURES**

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4   **Figure 1.** During the COVID-19 pandemic, our statistics team continued training via Internet video meetings.

5   One of the team members is giving a workshop (in Spanish) on statistical tests performed for comparing more

6   than two groups, like the one-way ANOVA test.

7

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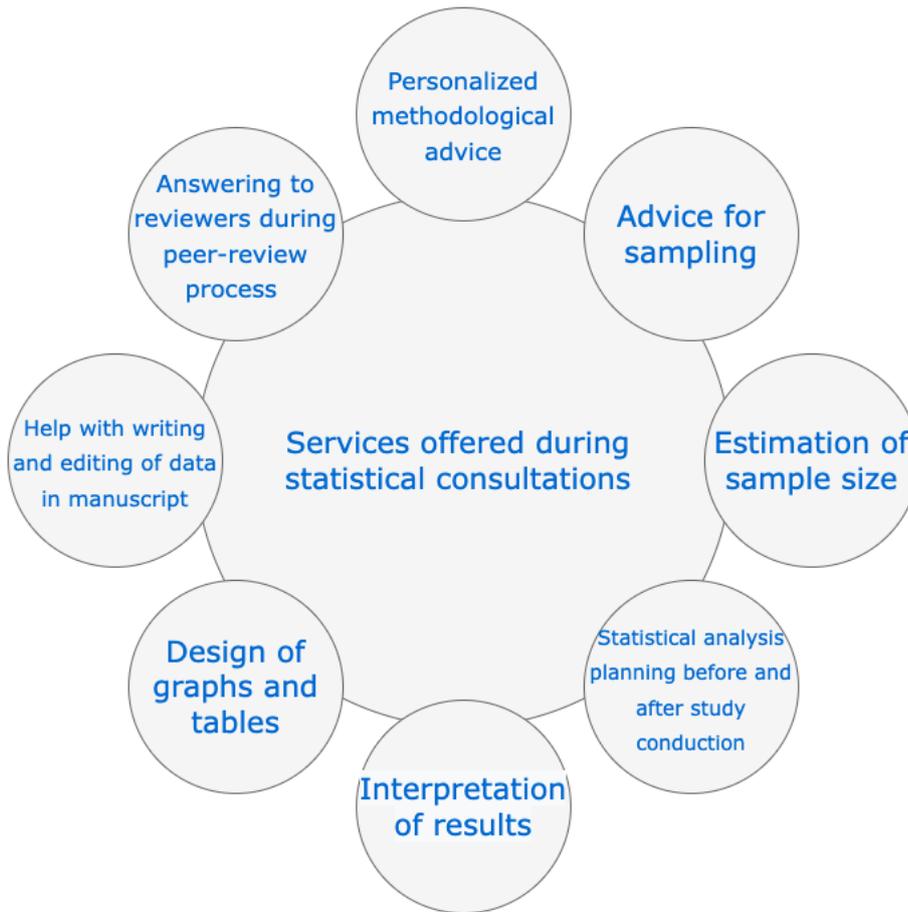
2 **Figure 2.** Supervised statistical services offered in the consultations by the student statistical team in training.

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