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IJMS

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Year 2026 | Months Jan-Mar | Volume 14 | Issue 1

IJMS

International Journal *of* Medical Students

The International Journal of Medical Students (IJMS) is a peer-reviewed, diamond open-access journal (e-ISSN 2076-6327) that disseminates research and experiences of medical students and recently graduated physicians worldwide.

The Journal considers submissions with at least one early-career author and, for research articles, requires senior researcher oversight. IJMS publishes Original Articles, Short Communications, Reviews, Case Reports, Experiences, Interviews, and Letters.

Published quarterly by the University of Pittsburgh Library System, IJMS promotes high-quality scientific standards, international collaboration, and research capacity among early-career scientists.

International Journal of Medical Students
Year 2026 - Volume 14 - Issue 1

IJMS

INTERNATIONAL JOURNAL *of* MEDICAL STUDENTS

The *International Journal of Medical Students* (IJMS) is a diamond open-access, peer-reviewed scientific journal that publishes original research across all fields of medicine. Founded in 2009, it was established to disseminate the scientific work and experiences of medical students (MBBS, MD, DO, MD/MSc, MD/PhD) and recently graduated physicians (within three years of graduation) worldwide, serving as a platform for early-career scientists under rigorous scientific publication standards.

The *IJMS* considers submissions that include at least one author who is a medical student or a recently graduated physician. For research articles, early-career authors must be accompanied by a senior researcher who assumes responsibility for the integrity and quality of the work. The Journal publishes Original Articles, Short Communications, Reviews, Case Reports, Experiences, Interviews, and Letters.

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In 2025, the *IJMS* had an acceptance rate of 22% (839 submissions), with publications originating from 40 countries. The average time to first decision was 5 days, 72 days to acceptance, and 272 days to rejection. The time from submission to publication ranges from three to six months, depending on the peer review process and author responsiveness. The *IJMS* h-index in Google Scholar is 23.

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Authors and reviewers remain anonymous to each other throughout the evaluation (double-masked peer review). Reviewers are given three weeks to complete their evaluations. All participants are required to maintain confidentiality of submitted manuscripts and treat their contents as privileged information until publication. Final decisions are made by the Editor-in-Chief and the Editorial Board.

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Editorial

Advancing Global Medical Student Research: Key Updates from IJMS and WCMSR 2026

Tanishqa Sheth,[1] Sayali Sandeep Kulkarni,[2] Maria Bozika,[3] Prateek,[4] Manali Sarkar,[5] Sajjad A. Khan,[6] Abdulbasit O. Muili,[7] Mihnea-Alexandru Găman,[8] Francisco J. Bonilla-Escobar.[9]

Medical student research is no longer peripheral to academic medicine; it is increasingly visible, structured, and expected. Over the past decade, opportunities for early-career researchers to engage in scientific work have expanded, but not always in ways that are equitable, rigorous, or well-integrated into training. Against this backdrop, the International Journal of Medical Students (IJMS) and its World Conference of Medical Student Research (WCMSR) have evolved as complementary platforms designed to address these gaps.[1] This editorial outlines the current positioning of IJMS, recent growth and structural developments, and the strategic role of WCMSR 2026 in advancing global, early-career research.

1. Reframing the Role of Medical Student Research

The IJMS was established in 2009 around a premise that has often been underestimated: that medical students can produce meaningful, publishable scientific work.[2] Over time, that premise has required less defense and more stewardship. What began as a corrective to limited publication opportunities has evolved into a sustained editorial model that integrates dissemination with training, and access with rigor.[2]

The IJMS now operates within a mature framework aligned with the International Committee of Medical Journal Editors (ICMJE) recommendations, the Enhancing the Quality and Transparency Of Health Research (EQUATOR) network reporting standards, and the Committee on Publication Ethics (COPE) principles.[3-6] It has become not simply a venue for early-career research, but a system that shapes how such research is produced, reviewed, and refined. The journal's dual mandate, open-access dissemination, and structured editorial training, remains its defining feature. Moreover, the absence of publication fees also reduces barriers to publication, while the supervised involvement of student editors embeds education within the editorial process itself.

These combinations have broader implications. Early exposure to peer review and reporting standards does not only improve individual manuscripts; it influences how future clinicians interpret evidence, design studies, and engage with scientific literature. In this sense, the IJMS operates at the intersection of publishing and professional formation.

2. Growth, Visibility, and the Question of Quality

The Journal's recent growth reflects both increased demand and improved internal capacity. Submission volumes have risen substantially, reaching 839 in 2025, with an acceptance rate of 22%.[4,7] Contributors now represent over 40 countries, and readership extends to more than 190 countries, supported by a fully open-access model.[4]

While these metrics indicate reach, they raise a more important question: Is growth is being matched by quality? Increased submissions inevitably introduce pressure on editorial systems, reviewer availability, and consistency in decision-making. The IJMS has responded by reinforcing adherence to reporting standards and maintaining structured peer review processes. The observed increase in methodologically robust submissions, those using predefined analyses, established reporting frameworks, and stronger study designs, suggests that the Journal's emphasis on rigor is influencing the behavior of its contributors.

Bibliometric indicators, including an h-index of 23 and an h5-index of 19, further suggest that IJMS publications are entering broader scientific discourse.[7] However, the long-term relevance of the Journal will depend less on citation counts than on its ability to sustain methodological standards while expanding access.

3. Editorial Structure as an Educational Model

The IJMS's editorial organization is not incidental; it is central to its function. The journal's layered structure, comprising the Executive Committee, Editorial Board, Associate Editors, and Student Editors, allows it to distribute workload while preserving oversight and training.[2]

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Student Editors, working under supervision, participate in early manuscript evaluation. This model is often viewed as unconventional in biomedical publishing, but it is precisely this structure that differentiates IJMS. It transforms peer review from a closed evaluative process into a guided educational experience. At the same time, final decision-making remains anchored in experienced editorial leadership, maintaining credibility.

As the effectiveness of this model depends on calibration, variability in reviewer experience is an inherent limitation. Without structured training and supervision, it risks inconsistency. Therefore, continued investment in reviewer preparation and editorial oversight is therefore not optional; rather it's foundational to maintaining quality.

4. WCMSR 2026: Timing, Structure, and Strategic Relevance

The 5th IJMS World Conference of Medical Student Research (WCMSR) will be held virtually on July 11-12, 2026. Since its introduction in 2022, the conference has functioned as a complementary extension of the journal, offering a space where research can be presented, questioned, and refined before or alongside formal publication.

The 2026 timeline, from abstract submission in April to final presentations in July, reflects a structured workflow that parallels journal processes while remaining distinct in its objectives. It also intersects meaningfully with academic timelines, particularly for students preparing residency applications. Accepted abstracts, presentations, and awards provide tangible scholarly outputs that can be documented during a critical stage of professional development.[8]

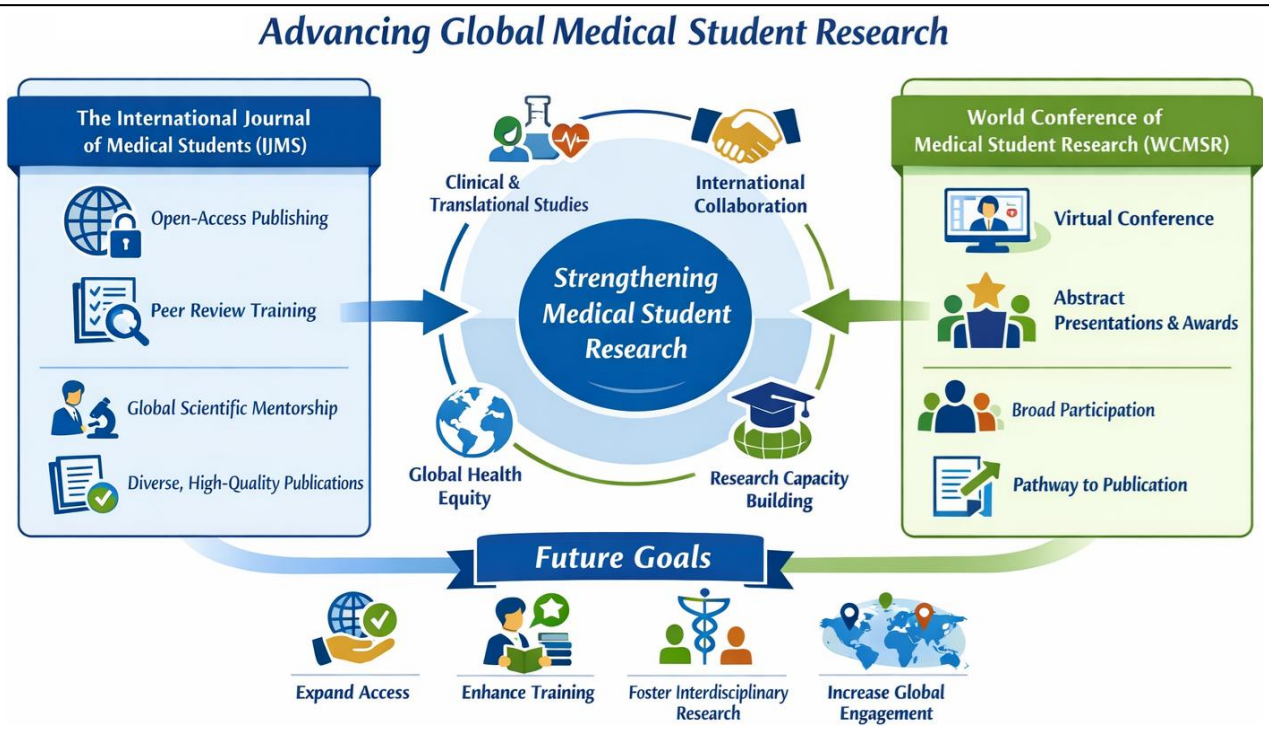
Operationally, the conference has become more defined. Responsibilities are distributed across clearly delineated roles, including abstract management, logistics, and program moderation. The requirement for standardized submissions, reviewer scoring, and pre-conference technical validation introduces a level of procedural rigor that aligns the conference with established academic expectations.[9]

The result is not simply an event, but an organized extension of the IJMS editorial ecosystem.

5. Beyond Access: WCMSR as a Training Environment

The value of WCMSR lies less in its accessibility, though this remains important, and more in its function as a training platform.[10] Unlike journals, which evaluate completed work, the conference engages researchers at an earlier stage.[11] It creates conditions in which methodology must be explained, assumptions defended, and findings contextualized in real time.

Figure 1. Conceptual Framework of the International Journal of Medical Students (IJMS) and the World Conference of Medical Student Research (WCMSR) in Advancing Early-Career Medical Research.



Legend: This diagram illustrates the complementary roles of the IJMS and the WCMSR within an integrated academic ecosystem. IJMS supports open-access dissemination, peer-review training, and mentorship, while WCMSR provides a structured platform for abstract presentation, feedback, and progression toward publication. Together, they strengthen medical student research through international collaboration, capacity building, and promotion of high-quality, globally relevant science. This figure was generated using ChatGPT (OpenAI) based on author-provided concepts and content. The authors reviewed, edited, and take full responsibility for the final figure.

For many participants, this represents a first exposure to external academic scrutiny.[12] Constructive feedbacks from reviewers and peers outside their home institutions introduces variability in perspective that is difficult to replicate within local academic environments. This process not only strengthens individual projects, but the researcher's ability to critically engage with evidence.[13]

The conference also reinforces continuity within the IJMS system. Participants frequently transition into editorial roles, while trained editors contribute to abstract review and conference organization. This bidirectional flow creates a feedback loop in which training, evaluation, and dissemination are integrated rather than isolated.

Importantly, accessibility measures: virtual participation, tiered fees,[14] and simplified submission requirements;[15] are meaningful only to the extent that they do not dilute standards. The sustained credibility of WCMSR depends on maintaining this balance.

6. Strategic Priorities: Managing Growth Without Dilution

As the IJMS and WCMSR expand, the central challenge is not growth itself, but the management of growth.

Maintaining methodological rigor remains the primary priority. Supporting early-career researchers does not justify accepting work that fails to meet basic standards of study design or reporting. On the contrary, clarity in expectations is essential for meaningful training. The continued enforcement of frameworks such as CONSORT,[16] STROBE,[17] PRISMA,[18] and CARE[19] is therefore critical.

Representation is another area requiring attention. While participation spans multiple countries,[10,20-27] geographic distribution remains uneven. Structural barriers[28], including: language, institutional support, and financial constraints, continue to limit participation from certain regions.[29-32] Addressing these gaps will require targeted engagement rather than passive expansion.

Operational efficiency is an additional concern. Increasing submission volumes place strain on editorial workflows, reviewer recruitment, and decision timelines. Without clear processes and expectations, delays can erode author trust and reduce future participation.

Finally, the reliance on student-driven peer review necessitates sustained investment in training. The strength of the IJMS model lies in its ability to develop reviewers and editors internally, but this strength becomes a liability if training does not keep pace with responsibility.

Acknowledging these constraints is not a weakness; it is a prerequisite for sustainable development. We are committed to continue this journey and assess novel strategies towards improvement and sustainability.

7. Conclusion

The IJMS and WCMSR represent a coordinated effort to redefine how medical students engage with research, not as passive recipients of knowledge, but as active contributors to its production, evaluation, and dissemination.[1-4] Their continued relevance will depend on maintaining a balance that is inherently difficult: expanding access while preserving rigor, training early-career researchers while upholding editorial standards, and growing globally without losing structural coherence.

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Original Article

Reducing No-Show Rates in Virtual Pediatric Weight Management Visits: A Quality Improvement Initiative

Madeline Mayer,[1] Elizabeth Hegedus,[2] Alaina P. Vidmar.[3]

Abstract

Background: Virtual delivery of comprehensive pediatric obesity treatment may reduce barriers such as time, cost, and travel distance. Despite these advantages, high no-show rates for first-time visits remain a significant challenge. The primary aim of this project was to reduce no-show rates for first-time visits. **Methods:** This clinician-led quality improvement project included a needs assessment to identify barriers to attendance and four sequential Plan-Do-Study-Act (PDSA) cycles. Each cohort received one of the following interventions: (A) orientation phone call at referral, (B) orientation text message at referral, (C) reminder phone call, or (D) reminder text message. No-show rates before and after implementation were analyzed using control charts, linear regression, and chi-squared tests. Odds ratios (OR) and 95% confidence intervals (95%CI) were calculated to evaluate the association between interventions and attendance. **Results:** A total of 845 eligible patients were included (pre-implementation n=480; post-implementation n=384). The baseline no-show rate for first visits was 38%. Following implementation, the no-show rate decreased to 20%, an 18% absolute reduction (p=0.02). Pre-visit reminder interventions improved attendance (Protocol C: OR=2.07, 95%CI=1.12-3.85, p=0.04; Protocol D: OR=2.66, 95%CI=1.12-6.33, p=0.02), whereas orientation interventions at referral showed no significant improvement. Cost analysis demonstrated that reminder text messages required the least financial and labor investment ($606 annually; ~35 minutes/week), while reminder phone calls produced the greatest improvement relative to cost. **Conclusion:** Pre-visit reminders delivered by phone or text significantly reduce first-visit no-show rates in a multidisciplinary pediatric weight management clinic. These low-cost, scalable strategies may improve access and engagement, particularly in telehealth care.

Introduction

According to the Centers for Disease Control (CDC), one in five children in the United States was identified as overweight or obese between 2017 and 2020.[1] More recent models estimate that if these rates continue by 2050, more than half of youth will live with obesity.[2] In 2023, the American Academy of Pediatrics (AAP) released updated clinical practice guidelines recommending comprehensive obesity treatment that integrates intensive lifestyle modification, obesity pharmacotherapy, and bariatric surgery for the care of youth with obesity.[2] To provide this care, many children's hospitals deliver intensive, multi-disciplinary pediatric weight management (PWM) programs that provide longitudinal comprehensive family-based treatment.[3,4] In response to the COVID-19 pandemic and the high prevalence of youth living with obesity, many PWM programs transitioned from in-person delivery to virtual models to expand the scope and reach of the program.[5–7]

Many factors threaten the sustainability of PWMs in the United States.[8] These include policy, hospital, personnel, funding, and individual-level components.[8] Virtual delivery of an intensive chronic care model may improve accessibility by addressing cost, time away from work and school, and travel barriers that many patients and families experience with in-person interventions.[9–13] Despite the potentially positive outcomes of the virtual delivery model, there remain challenges with participant adherence and engagement in PWM programs that persist across in-person and virtual delivery platforms in pediatrics to date.[14]

Growing literature has shown that PWM programs that report high attendance rates for in-person interventions often communicate with patients via telephone, mail information packets, and provide orientation sessions before or after the initial patient visit.[2,15] Many PWM programs offer standard orientation sessions before the program's initiation.[15,16] However, published data is limited on whether these additional sessions improve attendance rates and engagement consistently.[17,18] There is a paucity of literature exploring whether orientation-type interventions are required when the programs are offered purely through virtual platforms. Much of this research is limited to the United States, and there are few studies outside of the United States and none in non-Western countries.

Additionally, automated, electronic health record (EHR) managed visit reminders have been utilized for many years to inform patients and families of upcoming visits. However, this method has several limitations, including erroneous or inaccurate contact information in the EHR, families' inability to receive reminders, and imperfect technology. All these factors have limited this automated tool in significantly improving attendance rates.

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The virtual PWM program used in this study consists of a 12-month, interdisciplinary treatment using a nurse practitioner or physician and dietician focused on behavior modification and medical intervention to address the patient's specific needs in improving their weight. The patient population that the program serves is mainly non-English speaking, of low socioeconomic status, and/or uninsured or publicly insured. These factors lend to issues of low health literacy and the need for optimal technology to receive virtual communications within this population. Because of these factors, it is theorized that many patients and families need to be made aware of why or when they were referred to the clinic, what treatment is received in the program, and how and when they can schedule and access their appointments. Considering these factors, this study implements various modes of communication and orientation forms to determine the most effective reduction of no-show rates to first appointments.

This quality improvement project aims to optimize communication and orientation strategies to increase patient attendance at first-time visits to a single center, urban PWM program. The specific aims are to conduct a needs assessment from clinical staff and families, design four PDSA cycles to decrease no-show rates by 10% over three months and collect process measures to assess the time and resources required to achieve this improvement to inform future dissemination. The 10% target was selected based on historical performance benchmarks within our clinic, and informed by achievable goals in similar quality improvement initiatives.

Methods

Design, Setting, and Sample

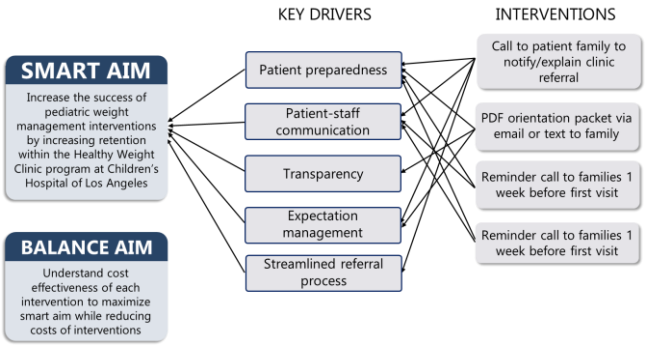
This project used a pre-and post-intervention design. This four-stage problem-solving model study design included a needs assessment to identify barriers to patients' attendance at first-time visits and four plan-do-study-act (PDSA) cycles. The driver diagram outlines how to decrease the incidence of attrition among newly referred patients to the endocrine weight management clinic (***Figure 1***).

The setting was a multidisciplinary weight management clinic at Children's Hospital Los Angeles (CHLA). The primary outcome was no-show rates for the first visit, defined as patients who either canceled their first visit within 24 hours of the scheduled date or no showed. Secondary outcomes investigated the feasibility and cost of each cycle implementation. The Children's Hospital institutional review board approved the retrospective analysis of collected data. This project was reviewed by the Children's Hospital Los Angeles Institutional Review Board and determined to be exempt from IRB oversight due to its classification as a quality improvement initiative.

Patient Selection

Patients eligible for this study were defined as youth, ages 2 to 21 years old, referred to the CHLA endocrine weight management program between January and August 2022. The four quality improvement protocols were implemented between June and August 2022, with a new cycle implemented every three weeks. For cycles A and B, all new referrals to the clinic during the respective periods of each cycle were used as subjects. In cycles C and D, all patients with a first appointment scheduled during the respective cycle periods were used as subjects. No patient who was a part of cycles A and B were used as subjects in cycles C and D. To analyze whether the combination of protocols had decreased the no-show rates for the first visit, pre-program implementation dates were defined as all patients with a first visit to the weight management clinic between June 2021 and June 2022, and post-implementation was defined as patients who attended a first visit between June 2022 and June 2023.

Figure 1. **Composite Analysis of the Smart Aim, Key Drivers, Intervention Protocol Design, and Balance Aims.**



Interventions

A needs assessment survey was conducted in December of 2021. The assessment was a 10-question anonymous survey sent to clinicians and clinic staff in the endocrine weight management program. All clinicians and staff completed the needs assessment, and three common themes interfered with patient completion of the 12-month program: patient barriers to scheduling visit 1, low attendance to visit 1, and low attendance to follow-up visits. The weight management team in the division of endocrinology at CHLA strategically executed a series of protocols that made up a multifaceted quality improvement program, explicitly addressing the no-show rate for the first visit based on scientific evidence and accumulated experience. Since visit attendance is multifactorial, these protocols were designed to target many factors simultaneously, including confusion around the referral process and wait time, discrepancies around the expectations for the weight management intervention, and technical difficulties around telehealth. All guidelines in the program were followed simultaneously and periodically evaluated by the multidisciplinary team. Feedback and corrective measures were offered to the faculty and staff accordingly. This analysis compared the no-show rate to the first visit before and after implementing the quality improvement program.

These families were referred to a multi-disciplinary pediatric weight management program. The clinical team included a pediatric endocrinologist, pediatrician, dietitian, clinical coordinator, and two medical students. Monitoring and feedback education

for staff and trainees were provided monthly, printed copies of the protocols were kept in the clinic for easy accessibility, and standardized audits were conducted to monitor compliance with interventions. A run chart, which looked at attrition trends over time, was constructed quarterly to monitor the program's effectiveness.

The purpose of protocols A and B was to increase transparency around the timing of the patient's first visit and the expectations of the weight management program. Protocols A and B included confirmation that their referral was received and being processed, details about the 12-month weight management intervention they were referred to, and realistic wait time estimates for scheduling their first visit as outlined in ***Supplementary Material A***. These protocols were chosen after providers identified barriers to accessing care, including long wait times between referral and first visit (~6-9 months) and the family's unawareness of the time commitment to the weight management clinic.

The purpose of protocols C and D was to remind families regarding their upcoming visit. Compared to the generic reminder call that the pre-implementation families received. Protocols C and D included additional details about the 12-month weight management intervention they were referred to, how to attend a telehealth visit, and a reminder that they could attend a telehealth visit from anywhere and did not need to come to the clinic as outlined in ***Supplementary Material A***. These protocols were chosen after clinical experience from providers identified needing clarification around how to attend a telehealth visit and what was expected from the families.

Training for team members who carried out each protocol included standardized scripts and provided supplemental information about the weight management program as outlined in ***Supplementary Material B***. The purpose of this training was to ensure standardization of information passed to each patient within each cohort.

Financial Analysis

The two medical students who carried out all phone calls and texts tracked the labor time associated with protocol implementation as outlined in ***Supplementary Material C***. The cost was then calculated by the average hourly pay of clinic secretarial staff who would carry out the calls and texts in the place of the medical students outside the context of this study ($12/hour). Cost differences were compared between the four protocols.

Statistical Analysis

Data was analyzed using JMP®, Version 17.0.0. SAS Institute Inc., Cary, NC, 1989–2023. Descriptive statistics were generated for categorical variables, including frequency distributions and percentages. Comparison between pre- and post-implementation groups was done using Chi-squared and Fisher's exact tests for categorical variables. All predictor variables with a p-value <0.05 were considered potential confounders, and adjusted odds ratios (aOR) and 95% confidence intervals (CI) were calculated accordingly. The odds ratio, likelihood ratio, risk difference, and Fisher's exact test were generated for the no-show and cancelation rates between the pre- and post-implementation groups. Each protocol was compared independently to the pre-implementation cancelation and no-show rates.

Results

A total of 845 patients met eligibility criteria for this study. Of these, 480 patients were seen in the endocrine weight management clinic between June 2021 and June 2022 (pre-implementation group), and 384 patients were seen between July 2022 and July 2023 (post-implementation group). The overall patient population at Children's Hospital Los Angeles had a mean age of 10.5 ± 2.7 years, mean HbA1c of 5.3 ± 0.9%, 81% Hispanic, 63% female, and 85% covered by public insurance. Previous studies in the endocrine weight management clinic at CHLA indicate that this cohort mirrors the broader pediatric population served by the hospital.

Table 1 summarizes attendance, cancellations, and no-show rates for each intervention cycle, and ***Figures 2*** and ***Figure 3*** visualize the no-show rates for each cohort. Youth in post-implementation protocols C (pre-visit reminder phone call) and D (pre-visit reminder text message) had significantly higher odds of attending their first visit compared with the pre-implementation group (Protocol C: OR = 2.07, 95% CI: 1.12–3.85, p = 0.04; Protocol D: OR = 2.66, 95% CI: 1.12–6.33, p = 0.02). Full details including odds ratios, likelihood ratios, p-values, risk differences, and confidence intervals are presented in ***Table 2***.

Table 1. **Summary of the Post-Implementation Attendance, Cancelation, and No-Show Rates for the Four PDSA Intervention Protocols (A, B, C, and D) Across the Study Cohort.**

PDSA Cycle	Attended Visit (n=117)	Canceled Visit (n=39)	No-showed Visit (n=17)	Total Visit (n=173)
Protocol A, n (%)	31 (67)	10 (22%)	5 (11)	46
Protocol B, n (%)	34 (56)	21 (34)	6 (10)	61
Protocol C, n (%)	28 (78)	3 (8)	5 (14)	36
Protocol D, n (%)	24 (80)	5 (17)	1 (3)	30

Figure 2. **Distribution of Visit Outcomes Across PDSA Protocols (A–D) in a Virtual Pediatric Weight Management Program.**

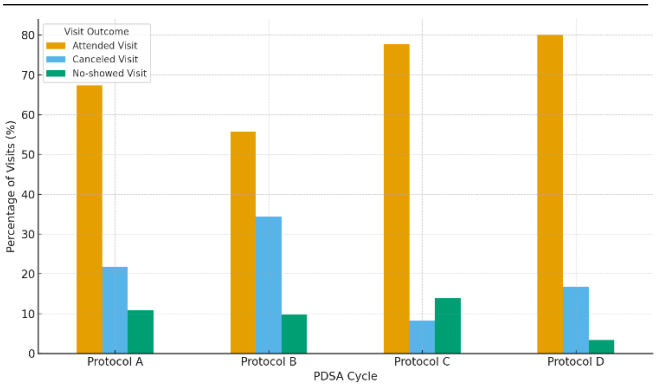


Table 2. **Association Between PDSA Protocols and Changes in No-Show/Cancelation Rates Compared with Pre-Implementation Cohort.**

PDSA Cycle	Combined No-show/Cancelation rate post intervention	Odds Ratio	Likelihood Ratio	p[1]	Risk Difference	95%CI	p[2]
Protocol A	33%	0.67	2.2	0.13	-0.1	(-0.2, -0.03)	0.08
Protocol B	44%	0.37	18.8	<0.0001	-0.2	(-0.3, -0.1)	<0.0001
Protocol C	22%	2.07	3.7	0.05	0.2	(0.01, 0.3)	0.04
Protocol D	20%	2.67	5.1	0.02	0.2	(0.05, 0.4)	0.02

Legend: Post-intervention no-show/cancelation rates for each PDSA protocol comparing pre-implementation (n=480) and post-implementation (n=384) cohorts. OR, LR, and RD (95% CI) are reported. p1 = likelihood ratio; p2 = Fisher's exact test. Positive RD indicates reduction relative to baseline.

Figure 3. **Distribution of Visit Outcomes by Intervention Type Across PDSA Protocols in a Virtual Pediatric Weight Management Program.**

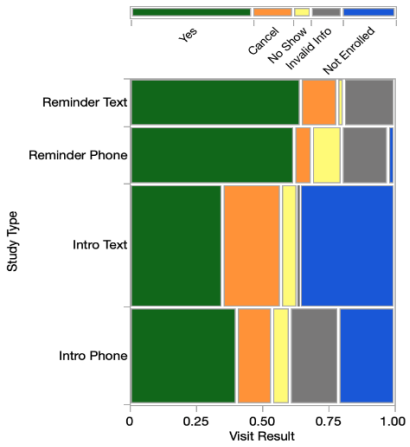
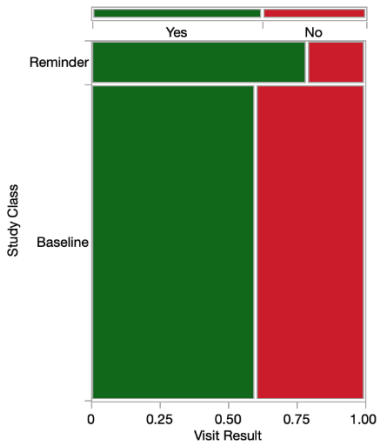


Figure 4. **Impact of Pre-Visit Reminders (Protocols C + D) on No-Show Rates in a Virtual Pediatric Weight Management Program.**



No significant improvements in attendance were observed for protocols A (orientation phone call at referral) and B (orientation text at referral) (Protocol A: OR = 0.66, 95% CI: 0.23–1.03, p = 0.08; Protocol B: OR = 0.37, 95% CI: 0.13–0.66, p < 0.001), suggesting that pre-visit reminders were the most effective interventions.

When combining protocols C and D to assess the impact of any pre-visit reminder, the post-implementation no-show rate decreased by 18% compared with the pre-implementation group (baseline no-show rate 38%). Results are summarized in ***Table 3*** and visualized in ***Figure 4***.

As a balancing measure, cost-effectiveness was analyzed for each intervention. Annual costs varied across protocols: A = $4,247, B = $2,513, C = $953, and D = $606. Protocol D was the least resource-intensive, requiring approximately 35 minutes of labor per week at $12/week, whereas protocol C required 55 minutes per week at $18/week. Considering the cost-to-benefit ratio, protocol C achieved the largest reduction in no-show rates relative to cost. Full financial analysis is presented in ***Table 4***.

Table 3. **Impact of Pre-Visit Reminders (Protocols C + D) on First-Visit Attendance Compared with Pre-Implementation Cohort.**

Study Group	Attended Visit, n (%)	Did Not Attend, n (%)	Total (n)
Pre-Visit Reminder (Protocols C + D)	288 (60.0)	192 (40.0)	480
Pre-Implementation	52 (78.8)	14 (21.2)	66
Total	340 (62.3)	206 (37.7)	546

Legend: Comparison between groups includes relative risk (RR = 0.76, 95% CI: 0.65–1.70, p < 0.001) and odds ratio (OR = 0.40, 95% CI: 0.21–0.78, p < 0.001) for non-attendance. Pre-visit reminders include combined Protocols C and D (phone and text reminders).

Table 4. **Time and Cost Requirements Across PDSA Intervention Protocols.**

Protocol	Time to Collect Information (min/wk)	Time per Intervention (min)	Patients per Week (n)	Total Time (min/wk)	Weekly Labor Cost ($)	Annual Cost ($)
A	120	5	25	245	82	4,247
B	120	1	25	145	48	2,513
C	30	5	5	55	18	953
D	30	1	5	35	12	606

Legend: Costs (US dollars) are based on estimated administrative labor at standard hourly rates. Protocols A-B correspond to orientation interventions at referral, while Protocols C-D correspond to pre-visit reminder interventions. Wk: week.

Discussion

This quality improvement project addressed the high no-show rate for the first virtual weight management clinical program visit at a single urban center. Patients were either referred internally or by community clinicians, and the standard wait time from the

day of referral to the first visit varied between three and six months due to an overwhelming number of referrals received for weight management care in this region. This study aimed to reduce the no-show rate by 10% by incorporating staged reminders by engaging with future patients at two different points: upon referral (protocols A and B) and upon first visit (protocols C and D). These cycles were not additive, and each implementation was independently used on a separate cohort. However, the discrepancy between the number of patients who were never enrolled between A and B and C and D, where more patients in groups A and B were never enrolled, must be recognized. In groups C and D, the patients had already been scheduled for their first clinic visit compared to groups A and B, who had just recently been referred to the clinic. It is possible that the subjects in groups C and D were already more likely to attend their first visit than groups A and B because they showed the initiative to schedule their clinic visit without an orientation. Therefore, groups C and D may have had fewer no-shows than groups A and B, confounding the results.

Personnel time and cost were estimated during the intervention period to assess and capture balance and process measures. The clinic received roughly 100 new referrals per month with an expected increase in the number of referrals as the pediatric obesity epidemic continues. With current capabilities, the clinic saw approximately 40 new patients a month. Each protocol had a variable time burden and, in turn, a cost burden on the clinic. Protocols A and B are significantly more expensive than protocols C and D, and no significant decrease in no-show rate was found after initiating protocol A or B alone. Protocols C and D were equally effective at decreasing the no-show rates. Still, Protocol D was 36% cheaper than Protocol C. Across pediatric healthcare systems, there was higher cost and greater underutilization of clinical service. This discrepancy resulted in increasing demand and price.[19]

While there is a paucity of pediatric data on this topic, various adult studies have highlighted the negative impacts of high no-show rates on the health care system from a cost perspective.[19] Berg *et al*, estimated 67,000 unattended scheduled visits can cost the healthcare system approximately seven million dollars.[20] While these estimates look different based on the hospital system and specialty considered, any low-cost tool available that could decrease no-show rates may be used to help healthcare organizations be more effective and efficient.[19–22] Taken together, implementing a detailed text reminder may be an affordable and effective tool for decreasing the no-show rate at a pediatric weight management clinic, increasing clinic efficiency and profitability. These results are in line with other meta-analyses and review papers that have found text-message reminder systems effective at increasing visit attendance.[23–25]

In a pandemic world, there remains a shortage of healthcare providers, and an increased burden on staff is undesirable.[2,26,27] One alternative that may increase attrition is to update the baseline EHR text reminder system to provide more detailed instructions. Protocols C and D provided a text/phone call with more information than the baseline generic visit reminder. Future research should compare the impact of one detailed text reminder vs. multiple detailed text reminders vs. one generic text reminder. Text reminders are chosen for future research because of their equal effect on the no-show rate compared to phone calls. In addition, a focus group is proposed to interview families on barriers to attending weight management visits and better understand what the patient and the families would prefer for additional support.

Limitations

This project was conducted in a single urban clinical setting in the United States, limiting the results' applicability. The participants were selected through convenience sampling and did not provide an accurate representation of the general population. The retrospective nature of the pre-intervention data collection puts the data at risk of selection and misclassification biases. We used a random sampling technique to distribute patients into the different protocols to decrease selection bias. Standardized protocols, random auditing, and monthly feedback education sessions for the staff and trainees were implemented to decrease misclassification bias. Only gender and age demographic data were collected; other data regarding participants' ethnicity, educational levels, and parent employment could have contributed to information on social determinants of health.

Conclusions

The primary aim of this study was to reduce no-show rates for first visits in a virtual pediatric weight management program by 10%, with secondary aims evaluating the time and financial costs of achieving this reduction. This clinician-driven quality improvement initiative demonstrated that pre-visit reminders delivered via text messages and phone calls can effectively decrease no-show rates for first-time visits. Staged reminders that include clinic-specific information were particularly effective in improving attendance in a specialty virtual clinic setting.

These findings are broadly translatable to pediatric clinical settings, especially in underserved areas where virtual care can enhance access. Reminder texts or phone calls are low-cost, scalable interventions that can be implemented in most clinics using existing infrastructure, such as phones or EMR messaging systems. Further study with prospective, controlled data collection is warranted to validate these results and optimize implementation strategies.

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Author Contributions

Conceptualization, Formal Analysis, Investigation, Methodology, Writing – Review and Editing: MM, EH, APV; Data Curation, Writing – Original Draft: MM, EH; Funding Acquisition, Project Administration, Resources, Software, Supervision, Validation: APV.

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Supplementary Material

Supplementary Material A

Content of Pre-Visit Phone Calls and Text Messages

Phone Call Scripts

Protocol A: Call upon receiving referral

"Hello, this is [Name] calling from the Children's Hospital Los Angeles Weight Management Program. We've received a referral for [Patient First Name] to participate in our virtual weight management clinic.

I wanted to confirm that we have received the referral and to give you a brief overview of what to expect:

- The program is 12 months long and includes regular visits with a doctor or nurse practitioner and a dietitian.
- Because of high demand, it may take 3 to 6 months to schedule your first visit.
- All visits are virtual, and you will receive instructions before your appointment on how to connect.
- We'll contact you again when your appointment is scheduled.

Do you have any questions at this time about the referral or the program?"

Protocol C: Call 1 week prior to scheduled visit

"Hello, this is [Name] calling from the Children's Hospital Los Angeles Weight Management Program.

We're calling to remind you of your upcoming virtual appointment for [Patient First Name] on [Date and Time].

- The visit will be conducted via telehealth—no need to come to the hospital.
- You'll receive a Zoom link by email or text the day before the visit.
- Please make sure you have access to a smartphone, tablet, or computer with internet access.
- The appointment will last around 60–90 minutes.

If you have any questions or need to reschedule, please call us back at [Clinic Phone Number]. We look forward to seeing you!"

Text Message Templates

Protocol B: Text upon receiving referral

"Hello from CHLA Weight Management Clinic: We received your referral for [Patient First Name]. Due to high demand, your first virtual visit may be in 3–6 months. We'll contact you when it's time to schedule. Thank you!"

Protocol D: Text 1 week prior to scheduled visit

"Reminder: [Patient First Name] has a virtual CHLA Weight Management Clinic appt on [Date/Time]. No need to come in—visit is via Zoom. Check email/text day before for link. Questions? Call [Clinic Phone Number]."

Supplementary Material B

Staff Training for Phone Calls and Text Messaging

All phone calls and texts were conducted by two trained medical students during the study period. A standardized 30-minute training module was developed and administered by the clinical coordinator. Key elements included:

- **Script Familiarization**: Trainees were provided with the exact scripts (as above) and were instructed not to deviate significantly from the messaging.
- **Handling FAQs**: Common questions and appropriate responses were reviewed (e.g., what is the program about, what technology is needed for visits).
- **Documentation**: Each contact attempt was logged in a secure spreadsheet including time, result (answered, voicemail, no answer), and duration.
- **Cultural Sensitivity**: Trainees were instructed on respectful communication, particularly for Spanish-speaking families (translated scripts were provided).
- **Escalation Protocols**: Any clinical or scheduling questions were forwarded to the clinic coordinator.

Supplementary Material C

Labor Time Tracking and Financial Assumptions

Labor Time Tracking

- **Tool Used**: Time was tracked using manual time logs and verified against hospital scheduling software.

- Each text message took approximately **30 seconds** to send using a pre-written template in the EHR messaging system.
- Each phone call averaged **5–7 minutes**, including time spent calling, leaving a message, or speaking directly with families.
- **Weekly totals**: Labor time was calculated as the sum of total contacts made × average time per contact, verified across 3 weeks per cycle.

Cost Calculation Assumptions

- **Labor Rate Assumption**: Cost was estimated based on the **average hourly rate** of clinic administrative staff (**$20/hour**), assuming they would take over the task outside of the study.
- **Protocol C Cost**:
  - ~11 calls/week × 6 mins = 66 mins (~$22/week)
- **Protocol D Cost**:
  - ~11 texts/week × 30 secs = 5.5 mins (~$1.83/week)
- The **reported costs** ($18/week for Protocol C and $12/week for Protocol D) included additional time for documentation, preparation, and attempts to reach families multiple times if needed.

IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Original Article

Histopathologic Insights and Treatment Outcomes in PD-1 and PDL-1 Cutaneous Immune-Related Adverse Events: A Case Series

Amanda Rodriguez Orengo,[1] Alicia Mizes,[2] Irina Lerman,[3] Abigail I. Franco,[2] Mary Gail Mercurio,[2] Paul Blackcloud.[2]

Abstract

Background: Immune checkpoint inhibitors (ICIs), including therapies targeting anti-programmed cell death protein 1 (PD-1) or anti-programmed death-ligand 1 (PDL-1), are highly effective for treating various malignancies, but are often associated with immune-related adverse events (irAEs). Among these, cutaneous irAEs are the most prevalent, affecting about half of patients and varying widely in severity. irAEs can impact quality of life and lead to treatment discontinuation. Managing these side effects effectively is essential to allow continuation of therapy without compromising its efficacy. **Methods:** Retrospective case series. **Results:** We present three patients who developed severe cutaneous irAEs: two with pembrolizumab-induced lichenoid dermatitis and one with atezolizumab-induced psoriasiform rash. Initial treatment was guided by histopathologic findings, leading to the use of dupilumab, an interleukin-4 receptor (IL-4Ra) monoclonal antibody, in all three cases. While two patients achieved full resolution with dupilumab, the third case, which progressed to a clinically psoriasiform morphology, was later treated with apremilast, a phosphodiesterase 4 (PDE4) inhibitor, resulting in significant improvement. **Conclusion:** These cases highlight the critical role of combining histopathologic and clinical insights to customize treatment approaches. Both dupilumab and apremilast are steroid-sparing options with favorable safety profiles and offer effective alternatives to systemic corticosteroids without compromising the efficacy of ICIs.

Introduction

Immune checkpoint inhibitors (ICI) that target anti-programmed cell death protein 1 (PD-1) or anti-programmed death-ligand 1 (PDL-1) are utilized in the management of many malignancies, including melanoma, lung and renal cancer. They enhance antitumoral activity by reducing T cell inhibition; however, immune system activation is not specific to the tumor microenvironment, resulting in immune related adverse events (irAE).

Cutaneous irAE occur in up to 30-60% of patients taking ICIs and can have a wide variety of clinical presentations.[1] Common clinical manifestations include maculopapular, eczematous, psoriasiform, and lichenoid rashes. Pruritus may also present either alone or in association with a rash.[2]

Understanding the histopathologic and clinical features of cutaneous irAEs is important to determine the most appropriate treatment plan. We describe the cases of three patients, with a focus on histopathologic findings, who developed cutaneous irAEs secondary to either PD-1 (pembrolizumab) or PDL-1 (atezolizumab) inhibitors and were successfully treated with either dupilumab or apremilast.

Methods

This case series was conducted at the Department of Dermatology at the University of Rochester Medical Center. Patients in this case series developed cutaneous immune-related adverse events (irAEs) associated with immune checkpoint inhibitors targeting PD-1 or PD-L1 and received treatment with steroid-sparing agents, specifically dupilumab or apremilast, for management of their dermatologic toxicity.

Clinical data were extracted from electronic health records, including patient demographics, cancer diagnosis, type and duration of immune checkpoint inhibitor therapy, timing and severity of cutaneous irAEs, and prior treatments. Severity was classified according to the Common Terminology Criteria for Adverse Events (CTCAE). Histopathologic evaluation was performed through skin biopsies, which were reviewed to characterize inflammatory patterns and guide treatment decisions.

Treatment regimens, including dosing and duration of dupilumab and apremilast, were documented. Outcomes assessed included clinical response (based on body surface area involvement and symptom resolution), need for modification or discontinuation of oncologic therapy, and adverse effects related to treatment. Follow-up data were collected to evaluate durability of response and oncologic outcomes when available.

All patients provided written informed consent for the use of their clinical data and images for publication.

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Results

Table 1 provides a comprehensive summary of the primary characteristics of three patients seen at the University of Rochester Dermatology Department for management of their irAEs, including clinical and histopathologic features, treatment regimens, and cancer outcomes.

Case 1

An 87-year-old woman with stage IV lung squamous cell carcinoma receiving palliative pembrolizumab developed a diffuse pruritic rash starting six months after initiating therapy. Physical exam was notable for pink scaly papules coalescing into large plaques with overlying hemorrhagic crust involving >60% of her body surface area (BSA), including the extremities and trunk, but sparing the hands, feet, and face.

Her symptoms and rash had only minimal improvement with triamcinolone 0.1% cream twice daily, pramoxine hydrochloride lotion as needed, and fexofenadine 180 mg twice daily. Pembrolizumab was held, and she started a 1mg/kg prednisone taper. The taper was started at 50 mg and was intended to decrease by 10 mg weekly. It was extended over four months due to poor symptom control below 30 mg prednisone.

Five months after the rash onset, she was seen by dermatology and punch biopsies taken from her arm and thigh showed a band-like infiltrate of lymphocytes and rare eosinophils suggestive of lichenoid dermatitis (*Figure 1A*). Given the severity of her pruritus and failure to improve with prednisone, dupilumab (600mg loading dose and 300mg every other week) was initiated. Two months later, she was hospitalized for failure to thrive, and dermatology was consulted due to worsening of her rash (*Figure 1B*). A repeat punch biopsy was performed, which showed ulcer bed, not indicative of a new etiology.

Three and a half months after dupilumab initiation, her rash and pruritus were both improving and completely resolved (i.e. BSA 0%) after an additional two months. At her last follow up with dermatology, 6 months after the rash resolved, she did not report any rash recurrence or side effects of treatment.

After a goals of care discussion with oncology, the decision was made not to resume pembrolizumab. Despite not resuming treatment, she had had no signs of disease progression on CT chest and abdomen and continued to receive frequent monitoring via imaging.

Case 2

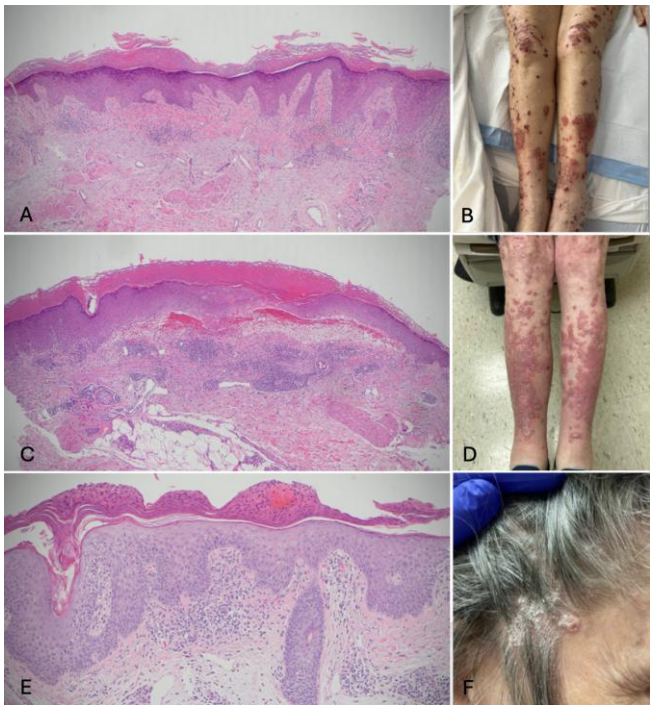
A 71-year-old woman with stage IIC cutaneous melanoma, classified as high risk for micro-metastatic disease (DecisionDx class IIB), began treatment with adjuvant pembrolizumab, for a planned duration of one year. After one dose, she developed ill-defined, pink annular patches on the bilateral axillae and upper lateral trunk. These did not progress until three months into treatment, when she developed more extensive erythematous, pink papules on the chest, upper back and upper extremities covering >10% BSA.

Table 1: **Patient Case Characteristics, Immune Related Adverse Event Type, Histology and Treatment**

Pt.	Sex	Cancer Type	ICI Treatment	Cutaneous irAE	CTCAE Grade	irAE Histopathology	Dupilumab or Apremilast Dosing	Cancer Outcomes
1	F	Stage V squamous cell carcinoma of the lung	Palliative pembrolizumab (PD-1)	Lichenoid dermatitis	3	Mild orthokeratotic hyperkeratosis and focal parakeratosis, wedge-shaped hypergranulosis of the acanthotic epidermis, a saw-tooth-like change to the rete ridge pattern, abundant dying keratinocytes, a dense band-like infiltrate of lymphocytes that focally obscures the dermal epidermal junction and rare eosinophils, consistent with dermatitis	Dupilumab 600mg loading dose followed by 300mg every other week	No evidence of disease progression
2	F	Stage IIC cutaneous melanoma	Adjuvant pembrolizumab (PD-1)	Lichenoid dermatitis	3	Extensive apoptotic basal layer keratinocytes leading to subepidermal blistering, epidermal hyperkeratosis and hypergranulosis within the dermis, a superficial lymphocytic perivascular infiltrate and focal mild lymphocytic vacuolar interface dermatitis, consistent with lichenoid dermatitis	Dupilumab 600mg loading dose followed by 300mg every other week	No evidence of disease recurrence
3	F	Extensive stage small cell lung cancer	Palliative atezolizumab (PDL-1)	Mixed eczematous and psoriasiform presentation	3	Mild irregular acanthosis of the epidermis with diffuse spongiosis, overlying parakeratotic scale with entrapped serum and accentuation of parakeratin around hair follicles and edema, lymphocytes and eosinophils in the papillary dermis, suggestive of seborrheic dermatitis or a spongiform drug eruption	Dupilumab 600mg loading dose followed by 300mg every other week transitioned to Apremilast 30mg twice daily	Lung mass stable, new brain metastasis on imaging

Legend: ICI, immune checkpoint inhibitor, irAE, immune-related adverse events; CTCAE, Common Terminology Criteria for Adverse Events.

Figure 1. **Clinical and Histopathology Images for Each Case Described.**



Legend: Case 1. A, Histology (H&E) at 40x showing mild orthokeratotic hyperkeratosis and focal parakeratosis, wedge-shaped hypergranulosis of the acanthotic epidermis, a saw-tooth-like change to the rete ridge pattern, abundant dying keratinocytes, a dense band-like infiltrate of lymphocytes that focally obscures the dermal epidermal junction and rare eosinophils, consistent with lichenoid dermatitis. B, Clinical image of the bilateral lower legs during inpatient hospital stay. Case 2. C, Histology (H&E) at 40x showing extensive apoptotic basal layer keratinocytes, epidermal hyperkeratosis and hypergranulosis within the dermis, a superficial lymphocytic perivascular infiltrate and focal mild lymphocytic vacuolar interface dermatitis, consistent with lichenoid dermatitis. D, Clinical image of the lower extremities around the time of dupilumab initiation. Case 3. E, Histology at 100x showing mild irregular acanthosis of the epidermis with diffuse spongiosis, overlying parakeratotic scale with entrapped serum and accentuation of parakeratin around hair follicles, and edema, lymphocytes. F, Clinical image of the scalp prior to apremilast initiation.

She started triamcinolone 0.1% cream twice daily, but after another four months, she experienced severe pruritus and the rash spread to her trunk and lower extremities, leading to pembrolizumab discontinuation. She had only minimal improvement with clobetasol 0.05% ointment twice daily, fexofenadine 180 mg daily, hydroxyzine 10 mg three times daily and famotidine 20 mg twice daily.

A punch biopsy of the thigh showed a lymphocytic vacuolar interface infiltrate suggestive of lichenoid dermatitis with secondary subepidermal blistering due to extensive apoptosis (***Figure 1C***). Her symptoms continued to be refractory to a 15-day prednisone taper, starting at 40mg daily and decreasing by 10 every 5 days.

Due to poor corticosteroid response (***Figure 1D***), dupilumab (600mg loading, then 300mg biweekly) was started. After one dose, she noted some improvement, and after five months, her rash had fully resolved (i.e. BSA 0%). She remained completely clear at follow-up 14 months after rash resolution, and dupilumab was discontinued.

Since pembrolizumab was given as adjuvant therapy and there was no evidence of recurrence on imaging, rechallenge was not pursued. No dupilumab side effects were reported throughout her treatment course. Although she never restarted pembrolizumab after her initial seven months of treatment, she remained free of melanoma recurrence on imaging, ctDNA surveillance and exam.

Case 3

A 72-year-old woman with extensive small cell lung cancer (E-SCLC) metastatic to the brain, and a history of indolent B-cell non-Hodgkin's lymphoma and urothelial carcinoma was receiving palliative atezolizumab 1200 mg every three weeks for her E-SCLC. 18 months into treatment, she developed a pruritic rash consisting of a few pink papules and greasy scale isolated to the scalp. She initially started over the counter hydrocortisone 1% cream twice daily and ketoconazole 1% shampoo daily with adequate symptom control.

Two months later, she developed worsening pruritus and similar psoriasiform salmon-colored papules and plaques with silverly scale on the neck, chest, back, abdomen and bilateral extremities, covering >30% BSA. She was referred to dermatology and a shave biopsy of the temple showed subacute spongiotic dermatitis with shoulder parakeratosis and follicular plugging, suggestive of seborrheic dermatitis or a spongiform drug eruption (***Figure 1E***). A deep shave biopsy was selected because it allowed for more extensive sampling, including the dermis, while also permitting healing by secondary intention in the temple region, which typically heals well using this approach.

Two months later, the rash had not improved with fluocinonide 0.05% solution twice daily, tacrolimus 0.1% ointment twice daily, triamcinolone 0.1% cream twice daily, and cetirizine 10mg daily. Due to poor response to topical treatments, dupilumab was started (600 mg loading, then 300 mg biweekly), but after three doses, her rash and pruritus persisted, even with the addition of clobetasol 0.05% cream and solution twice daily.

Given the psoriasiform appearance of the rash (***Figure 1F***) and the safety of apremilast while receiving immunotherapy, apremilast was initiated and tapered up to 30 mg twice daily. One month later, her rash and pruritus had significantly improved, and she stopped dupilumab, but continued to take apremilast. Due to rapid improvement of the rash with apremilast, a repeat biopsy was considered unnecessary due to not changing management.

She continued atezolizumab during this time due to cancer progression and metastases. Her lung cancer remained stable on chest CT, but a new brain metastasis was found on MRI, for which she received stereotactic radiosurgery. She continued to take

apremilast, with even greater improvement of her rash three months after starting the medication. At 14 months after starting apremilast, her rash remained stable, although complete clearance was not achieved. BSA was reported as <10%, improved from >20% BSA. She did not report any side effects from apremilast.

Discussion

ICIs are effective against numerous malignancies, but they cause non-specific immune system activation, leading to irAEs. They can affect multiple organ systems, but cutaneous irAEs are the most common and often develop the earliest.[3] Some evidence suggests that irAEs, including cutaneous manifestations such as lichenoid eruptions, psoriasiform eruptions, pruritus, and acneiform eruptions, as well as non-cutaneous irAEs, are associated with improved survival among ICI recipients, regardless of hospitalization for these events.[4,5] In most cases, irAEs are mild to moderate, but approximately 20% are severe, resulting in disruption of activities of daily living and ICI discontinuation.[6]

Current consensus guidelines for cutaneous irAEs are based on the Common Terminology Criteria for Adverse Events (CTCAE) which grades irAEs based on severity.[3,6,7] Treatment guidelines differ depending on the clinical and histopathologic appearance of the eruption, but for most types of reactions, treatment relies heavily on systemic corticosteroids and other immunosuppressive agents.[6] Conflicting evidence exists on whether steroids and other second-line immunosuppressive agents, due to diminished ICI efficacy or alterations to the tumor microenvironment, influence cancer progression in patients on ICIs.[1] Biologics are used only for severe (grade 3+) reactions.

For lichenoid dermatitis, guidelines recommend using infliximab or tocilizumab.[6] However, recently reported cases suggest that dupilumab, a monoclonal antibody targeting the interleukin-4 receptor (IL-4Ra), can be used for the treatment of lichenoid dermatitis secondary to ICI use.[8,9] IL-13 expression in two patient biopsies suggests a role for type 2 inflammation in ICI-induced lichenoid dermatitis and provides rationale for treatment with IL-4Rα antagonism.[8] Since dupilumab is not an immunosuppressant, it may be a safer alternative to systemic corticosteroids and other immunosuppressants in regard to side effects and the influence on antitumor response. Dupilumab has been successful for the treatment of many skin irAEs inflammatory patterns including spongiotic dermatitis, interface dermatitis, lichenoid dermatitis, perivascular dermatitis and sparse perivascular infiltrate, with an 87% overall treatment response rate. For severe psoriasiform rash induced by ICIs, biologics used for treatment include ustekinumab, guselkumab, infliximab, adalimumab[6]. Apremilast, an oral small molecule phosphodiesterase 4 (PDE4) inhibitor, has also been used to treat cutaneous irAEs with psoriasiform morphology. In a study of 5 patients treated with apremilast for de-novo ICI induced psoriasis, 80% had a partial response or improvement, while in a case series of three patients, all showed clinical improvement in PASI and BSA.[10,11] PDE4 inhibition elevates intracellular cAMP, promoting anti-inflammatory cytokine production (e.g., IL-10) and suppressing proinflammatory cytokines such as IL-17, IL-22, and IL-13.[10] Like dupilumab, apremilast is also regarded as an immunomodulating agent instead of an immunosuppressant drug and is thought to have a better safety profile in patients receiving ICIs.

Our case series highlights two instances where dupilumab was successfully used to treat pembrolizumab-induced lichenoid dermatitis, both demonstrating classic histopathologic findings of lichenoid dermatitis.[12] Additionally, we report a case in which biopsy findings revealed subacute spongiotic dermatitis, prompting treatment with dupilumab, with no improvement. Based on the rash's clinical presentation, which appeared more psoriasiform especially as it progressed, apremilast was initiated and resulted in substantial improvement in pruritus and reduction to <10% BSA. Literature suggests that about 15% of irAEs with a spongiotic dermatitis inflammatory pattern do not respond to dupilumab, which may explain treatment failure in this case.[9] Furthermore, at the time of biopsy for the third case, the rash had not yet evolved to a psoriasiform appearance, raising the possibility that a repeat biopsy might have revealed different histopathologic findings. We suggest that the consideration of a particular therapy for treating irAEs should be based on the combination of the histopathologic findings and the clinical appearance and progression of the rash. Another factor to consider is that in the first two cases, pembrolizumab treatment was discontinued, whereas in the third case, atezolizumab was continued, potentially contributing to the lack of improvement with dupilumab.

Our case series underscores the importance of utilizing both histopathologic and clinical findings in guiding treatment decisions, particularly for immunomodulating drugs, such as dupilumab and apremilast. We believe that both dupilumab and apremilast agents are excellent steroid-sparing agents to consider instead of other more potentially immunosuppressive biologics for treating irAEs. The evolving clinical and histopathologic presentations of irAEs highlight the need for a dynamic approach to diagnosis and management, tailored to the unique characteristics of each case.

Limitations

Our case series included all patients identified by the authors who were treated with dupilumab or apremilast for cutaneous irAEs (n=3). No additional cases, including non-responders, were identified. We acknowledge that larger cohorts or comparative studies with standard therapies would strengthen these conclusions. Additionally, patient perspectives on treatment were not included, as these data were not collected during treatment or follow-up. Finally, discontinuation of pembrolizumab in Cases 1 and 2 while atezolizumab was continued in Case 3 may have influenced treatment response, potentially leading to resolution with dupilumab in the first two cases and lack of improvement in the third.

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Original Article

Occupational Exposure to Blood and Body Fluids and Its Association with Anxiety Among Final-Year Medical Students: A Single-Center Cross-Sectional Study

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Abstract

Background: Occupational exposure to blood and body fluids (BBFs) remains a significant risk for healthcare professionals, particularly those in training. These exposures not only pose a biological hazard but may also contribute to psychological distress. This study aimed to assess the prevalence of BBF exposure among final-year medical students and investigate its association with anxiety levels. **Methods:** A cross-sectional study was conducted in January–February 2025 at Bursa Uludağ University Faculty of Medicine, Turkey. Of 271 final-year students, 203 participated (74.9%). Data were collected using a structured online questionnaire assessing sociodemographic characteristics, exposure history, and anxiety levels using the Generalized Anxiety Disorder-7 (GAD-7) scale. Predictors of anxiety severity were analyzed using negative binomial regression. **Results:** Overall, 56.2% of students reported at least one BBF exposure, with 67.5% experiencing multiple incidents. Common exposures occurred during venipuncture (50%) and arterial puncture (33.3%), with emergency department rotations posing the highest risk (66.7%). Despite high glove usage (100%), gown usage was low (16.7%). The mean GAD-7 score was significantly higher among exposed students (7.21 vs. 5.39, p=0.016). Regression analysis revealed BBF exposure (IRR=1.34), high-risk departments (IRR=1.52), and factors like performance anxiety (IRR=1.85) significantly increased anxiety severity. **Conclusion:** In this single-center study, occupational BBF exposure was highly prevalent among final-year medical students and was significantly associated with elevated anxiety levels, especially in high-pressure clinical settings. Despite existing safety training and orientations, the study's findings revealed persistent gaps in critical areas such as PPE compliance (low gown usage) and effective management of psychosocial stressors (hierarchical pressure).

Introduction

The risk of occupational infection with blood-borne pathogens in healthcare workers is a significant problem worldwide.[1] Each year in Europe, approximately 304,000 healthcare workers sustain percutaneous injuries from materials contaminated with Hepatitis B virus (HBV), 149,000 with Hepatitis C virus (HCV), and 22,000 with Human Immunodeficiency Virus (HIV). Notably, 90% of these injuries occur in developing countries.[2] An estimated 3 million healthcare workers experience percutaneous exposures annually worldwide, with 40%. occurring during training.[3] Exposure to blood and infectious body fluids represents a significant occupational hazard for healthcare workers and medical students during their clinical training.[4]

Sharps injuries, particularly needlestick injuries, impose significant economic burdens globally. Italy reports an average cost of €375 (range: €290-460) per incident for post-exposure management[5] , with 70-80% of occupational exposures involving percutaneous injuries.[3] In China, the total economic burden of needlestick injuries among healthcare workers was estimated to be ¥5.8 billion, with approximately half of this cost (¥2.8 billion) attributed to nurses.[6] According to studies conducted in Turkey, approximately 60% of healthcare professionals accidentally come into contact with patients' blood or body fluids at least once.[7–9]

In contrast to experienced clinical healthcare providers, medical interns often enter the clinical environment for the first time. Their limited medical experience, combined with an intense eagerness to perform unfamiliar procedures, frequently without sufficient training or supervision, may increase their vulnerability to occupational exposures.[10]

Anxiety-characterized by persistent worry impairing daily function, can be both a predisposing factor for, and a psychological consequence of, occupational exposures.[11] The findings of a meta-analysis suggest that the bidirectional relationship between work injuries and mental health challenges can indeed form a stress-injury cycle.[12]

This study aimed to investigate the relationship between BBF exposure and anxiety levels among final-year medical students, and to explore potential implications for medical education and occupational safety training. The insights derived from this investigation are intended to inform the design of medical curricula and educational policies that better prepare students for

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the realities of clinical practice, focusing on both physical safety and psychological well-being. To achieve this, we employed a cross-sectional design using a validated anxiety screening instrument (GAD-7) and multivariate regression analysis to assess factors associated with anxiety severity. We hypothesized that students who experienced blood or body fluid exposure during clinical training would exhibit significantly higher anxiety scores compared to their unexposed peers.

Methods

We conducted this cross-sectional study between January and February 2025 among final-year medical students at Bursa Uludağ University Faculty of Medicine. The target population consisted of 271 students. A total of 203 students completed the online questionnaire, yielding a response rate of 74.9%. We did not perform sampling, as the study aimed to reach the entire population. We collected data using a Google Forms survey. The online questionnaire began with an Informed Voluntary Consent Form, and we enrolled participants who agreed to the terms.

The questionnaire consisted of two main sections. The first section, consisting of 12 items assessing sociodemographic characteristics and occupational exposure to blood and body fluids, was developed by the research team based on a literature review of similar studies. Questions covered exposure history, routes, associated procedures, clinical rotations, PPE use, and self-reported contributing factors, with multiple selections allowed where applicable. The first section items were not designed as a formal scale, as they were intended to gather factual data on exposure events (e.g., whether an exposure occurred, in which department, what PPE was used) rather than to measure an underlying psychological trait.

The second section utilized the Generalized Anxiety Disorder-7 (GAD-7) scale, a validated 7-item self-report screening tool developed by Spitzer et al.[13] The GAD-7 is designed to assess the severity of generalized anxiety disorder (GAD) symptoms and serves as an effective brief screening instrument in clinical and research settings.

The GAD-7 scale is a 4-point Likert-type instrument (0 = not at all, 3 = nearly every day), with total scores ranging from 0 to 21. The scale contains no reverse-scored items. In the evaluation of the scale, total scores of 5, 10, and 15 serve as cutoff points for mild, moderate, and severe anxiety, respectively. Participants with a total score of 10 or higher should undergo further diagnostic assessment to confirm the presence of generalized anxiety disorder using additional methods. We categorized participants based on self-reported occupational exposure to blood and body fluids, forming exposed and unexposed comparison groups for subsequent analyses.

We assessed anxiety severity using the Turkish version of the GAD-7 scale, validated by Konkan et al.[14] This adaptation demonstrated excellent internal consistency in our sample (Cronbach's α=0.89).

We conducted statistical analyses using SPSS v23 for descriptive statistics (mean (SD), percentages) and bivariate comparisons (Chi-square, t-test). Given significant overdispersion in GAD-7 scores (variance/mean ratio = 3.7; Lagrange Multiplier test *p* < 0.01), multivariate analysis employed negative binomial regression via Python's statsmodels 0.14.0 with robust standard errors.

All variables were defined as follows: BBF exposure (any self-reported contact with blood or body fluids during internship, yes/no), high-risk department (rotation in emergency medicine or general surgery, yes/no), age (continuous, in years), gender (female/male), and contributing factors (self-reported reasons for exposure, with multiple selections allowed). For the negative binomial regression model, predictors included BBF exposure status (yes/no), rotation in a high-risk department (emergency medicine/general surgery; yes/no), age, gender, and self-reported contributing factors to exposure (e.g., performance anxiety, pressure from assistants). Categorical predictors were coded as binary variables (0 = no, 1 = yes). No categories were collapsed or treated as sparse, as each contributing factor had sufficient response frequencies to be included as an individual predictor. These contributing factors, while only reported by the exposed group, were included in the full model to assess their association with anxiety severity across all participants, acknowledging their origin as key themes from the exposed subgroup.

We did not conduct a formal power analysis due to the census approach; however, the final sample size of 203 participants (response rate: 74.9%) was sufficient to detect moderate effect sizes in group comparisons with 80% power at α=0.05.

There was no missing data in the completed questionnaires, as all items were required for electronic submission. Therefore, no imputation or additional handling of missing data was necessary.

Ethics Approval

The authors received permission from Bursa Uludağ University Health Sciences Research and Publication Ethics Committee with the board decision dated 29.01.2025 and numbered 2025-01/3.

Results

We present the demographic and exposure characteristics of the study participants in ***Table 1***. The study included 203 students, with a gender distribution of 58.6% female (n=119) and 41.4% male (n=84). Age distribution analysis revealed that 35% of participants (n=71) were 24 years old, while 22.2% (n=45) were 23 years old.

We found that 56.2% of participants (n=114) reported blood/bodily fluid exposures, with the following distribution: cutaneous (23.6%, n=48), percutaneous (12.8%, n=26), and dual-route exposures (10.8%, n=22).

We present the exposure context and risk factors of the study participants in ***Table 2*** (n=114 for exposure-related data).

Table 1. Demographic and Exposure Characteristics (N=203).

Characteristic	Category	n	%
Gender	Women	119	58.6
	Men	84	41.4
Age (years)	22	7	3.4
	23	45	22.2
	24	71	35.0
	25	39	19.2
	26	18	8.9
	≥27	23	11.3
Any exposure	Yes	114	56.2
	No	89	43.8
Exposure route* (n=114)	Cutaneous only	48	23.6
	Percutaneous injury (CPI)	26	12.8
	Mucosal only	3	1.5
	CPI + Cutaneous	22	10.8
	CPI + Mucosal + Cutaneous	7	3.4
	CPI + Mucosal	6	3.0
	Mucosal + Cutaneous	2	1.0

Legend: *Multiple selections were made

A total of 16.7% of exposed interns (n=19/114) reported blood/body fluid exposures during their first internship month. We observed a marked decline in exposure incidence after the first training month (from 16.7% to 10.5%, χ^2=4.1, p=0.03). We interpret this trend in the discussion section. Of the exposed participants, 32.5% (n=37/114) reported a single incident, while 67.5% (n=77/114) experienced multiple exposures (≥2 incidents) (χ^2=27.67, p<.001). Among those with recurrent exposures, the distribution was: 29.8% of exposed participants (n=34/114) had two exposures, 19.3% (n=22) three exposures, 8.8% (n=10) four exposures, and 9.6% (n=11) five or more exposures.

Exposures were most frequent during venous blood draws (50.0%, n=57), followed by arterial punctures (33.3%, n=38). When we evaluated exposure according to the department in which they performed their internship, we found that 66.7% of the exposed interns experienced blood or body fluid exposures during their emergency department internship, 25.4% during their general surgery internship, and 23.7% during their internal medicine internship.

Among exposed participants, 89.5% used PPE; we found that participants universally adopted gloves (100%), mask usage was 58.8%, but gown usage was low (16.7%). The most frequently cited contributing factors were intense working hours (31.6%), the pressure from assistants (21.9%), and inexperience (20.2%).

We present the prevalence of anxiety among final-year medical students in ***Table 3***.

Half of final-year medical students (50.2%) screened positive for anxiety. The mean GAD-7 score was significantly higher among exposed students (7.21 vs. 5.39, p=0.016). ***Table 4*** presents the

Table 2. **Exposure Context and Risk Factors (n=114 for Exposure-Related Data).***

Characteristic	Category	n	%
Training month at first exposure	Month 1	19	16.7
	Month 2	12	10.5
	Month 3	12	10.5
Exposure frequency	1 time	37	32.5
	2 times	34	29.8
	3 times	22	19.3
	4 times	10	8.8
	≥5 times	11	9.6
Procedures associated with exposure*	Venous blood draw	57	50.0
	Arterial puncture	38	33.3
	Surgical suturing	34	29.8
Clinical rotations associated with exposure*	Emergency Department	76	66.7
	General Surgery	29	25.4
	Internal Medicine	27	23.7
Personal Protective Equipment (PPE) use during exposure	Yes	102	89.5
	No	11	9.6
PPE components*	Gloves	102	100
	Mask	60	58.8
	Gown	17	16.7
Reported most contributing factors	Intense working hours	36	31.6
	Pressure from assistants	25	21.9
	Inexperience	23	20.2
	Occupational fatigue	17	14.9
	Time pressure	7	6.1
	Performance anxiety	3	2.6
	High anxiety	2	1.8

Legend: *Multiple selections were allowed for procedures, clinical rotations, PPE components, and contributing factors. All percentages in Table 2 are based on the exposed subgroup (n=114) and represent the proportion of exposed participants who reported each item. Percentages may sum to more than 100% due to multiple selections.

Table 3. **The Prevalence of Anxiety Among Final-Year Medical Students (N=203).**

Severity Level	n	%	95% CI
Mild	60	29.2	23.1-35.9
Moderate	26	12.8	8.6-18.2
Severe	16	7.9	4.6-12.4
Total with anxiety	102	50.2	43.3-57.1

Table 4. **Anxiety Severity by Blood/Body Fluid Exposure Status (N=203).**

Anxiety Severity	Exposed n (%)	Unexposed n (%)	Total n
Normal	52 (51.5)	49 (48.5)	101
Mild	35 (58.3)	25 (41.7)	60
Moderate	15 (57.7)	11 (42.3)	26
Severe	12 (75.0)	4 (25.0)	16
Total	114 (56.2)	89 (43.8)	203

distribution of anxiety severity by exposure status. Although the distribution of anxiety severity categories did not differ significantly between exposure groups (χ^2=3.43, p=0.33), 75% of participants with severe anxiety were in the exposed group. A non-significant trend toward higher anxiety prevalence was observed among exposed students when combining mild-to-severe categories (54.4% vs. 45.0%; χ^2=2.51, p=0.11; RR=1.21, 95% CI 0.91–1.61), warranting further investigation in larger samples. We present the Negative Binomial Regression Results model in ***Table 5***.

Our negative binomial regression (***Figure 1***) revealed that blood/body fluid exposure is associated with a 34% increase in expected anxiety severity (IRR=1.34; 95%CI=1.18–1.52; p<0.001), equivalent to a 2.1-point rise in mean GAD-7 scores. High-risk department rotations (emergency/surgery) amplified anxiety risk by 52% (IRR=1.52; 95%CI=1.29–1.80; p<0.001). Among exposure-contributing factors, performance anxiety (IRR=1.85; 95%CI=1.32–2.60) and pressure from assistants (IRR=1.61; 95%CI=1.27–2.04) demonstrated stronger effects than exposure itself. Notably, interns citing pre-existing anxiety as a contributor had 92% higher scores (IRR=1.92; 95%CI=1.15–3.22). Age and gender showed no significant associations.

Table 5. Multivariate Negative Binomial Regression for Anxiety Severity (GAD-7 Scores).

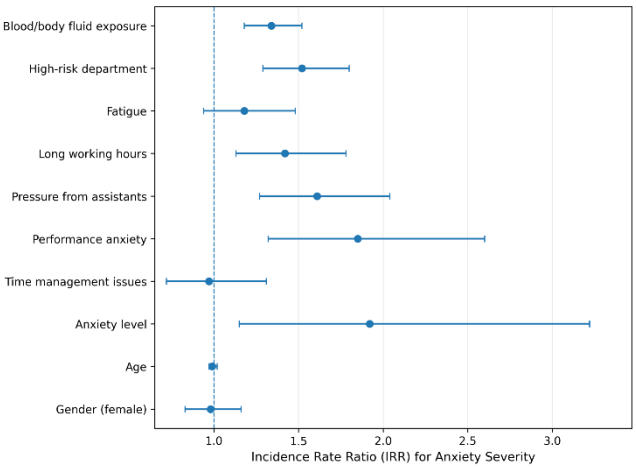
Predictor	IRR (95%CI)	p-value
Blood/Body Fluid Exposure	1.34 (1.18–1.52)	<0.01**
High-Risk Department*	1.52 (1.29–1.80)	<0.01**
Contributing Factors		
Inexperience	Ref.	Ref.
Fatigue	1.18 (0.94–1.48)	0.15
Long Working Hours	1.42 (1.13–1.78)	0.01**
Pressure from Assistants	1.61 (1.27–2.04)	<0.01**
Performance Anxiety	1.85 (1.32–2.60)	<0.01**
Time Management Issues	0.97 (0.72–1.31)	0.84
Anxiety Level	1.92 (1.15–3.22)	0.01*
Age	0.99 (0.97–1.02)	0.54
Gender (Female)	0.98 (0.83–1.16)	0.82

Legend: *High-risk departments: Emergency Medicine and General Surgery. † These contributing factors were reported by participants in the exposed group (n=114) and were included in the full model (N=203) to assess their association with anxiety severity. Model Fit: Log-likelihood = -438.7, AIC = 901.4; **p<0.01, *p<0.05

Discussion

Our findings suggest that more than half of the final-year medical students may have experienced occupational exposure based on self-report during clinical training, with varying rates that other studies have reported internationally: while higher than the 20.9% incidence that Souza-Borges et al. reported in Brazil (where 56.2% of cases involved sharps injuries) [15], it aligns closely with Inga et al.'s Peruvian cohort (51.5% reporting at least one biological accident).[16] However, our rates remain slightly lower than the 70.0% exposure frequency that Lee's study documented.[17]

Figure 1. **Adjusted Associations with Anxiety Severity Among Final-Year Medical Students.**



Legend: Forest plot displaying incidence rate ratios (IRRs) with 95% confidence intervals from a multivariate negative binomial regression model assessing factors associated with anxiety severity (GAD-7 score) among final-year medical students (N=203).

In terms of exposure routes, our study revealed that 23.6% of participants experienced cutaneous contact with blood or bodily fluids, while 12.8% sustained percutaneous injuries (such as needlestick or sharp-related incidents). Additionally, 10.8% of respondents reported both types of exposure. These figures are consistent with Inga et al., who reported that 80.6% of biological accidents involved contact with blood, and 47.6% resulted from sharps injuries.[16] Our findings also align with Alpat et al., who observed that 82.9% of medical trainees' high-risk exposures were due to needlestick injuries, followed by mucosal (35.7%) and sharps-related lacerations (30%).[18] We also noted the overall frequency of exposure: while 32.5% of our study reported a single incident, over two-third (67.5%) experienced repeated exposures (two or more), suggesting that cumulative risk increases with ongoing clinical practice. This pattern echoes Karstaedt and Pantanowitz's findings, in which 69% of interns reported at least one percutaneous exposure, and 30% recalled three or more during internship.[19] Such trends point to the importance of continued risk throughout training, especially in high-procedure environments and underscore the need for continuous, rather than one-off, safety education within medical curricula.

The timing of exposure appears to be closely associated with clinical inexperience. Notably, 16.7% of exposed interns reported their first exposure during the initial month of internship, with subsequent rates declining to 10.5% in the second and third months. This pattern suggests a possible learning curve effect, where early vulnerability may stem from unfamiliarity with procedures and institutional safety protocols. Karani et al. similarly reported that poor clinical skills and lack of supervision were associated with the significantly higher rates of accidental exposure among first-year trainees.[20] The fact that over two-thirds of our participants experienced repeated exposures

suggests a need for structured early-phase training programs and close mentorship during the first months of clinical rotations. Therefore, integrating enhanced procedural simulation and staged task delegation into early clinical curricula may help mitigate risk during this critical adaptation period.

Clinical procedures associated with exposure were primarily invasive in nature. Half of all incidents occurred during venous blood draws (50.0%), followed by arterial punctures (33.3%) and surgical suturing (29.8%). These findings are consistent with Karani et al., who reported that 38% of interns experienced injuries during phlebotomy and 19% while assisting with sutures.[20] The predominance of venipuncture-related injuries mirrors global patterns, including WHO's identification of phlebotomy as a high-risk procedure for needlestick injuries.[21] Exposure rates also varied notably by clinical rotation, with the highest prevalence observed in emergency medicine (66.7%), followed by general surgery (25.4%) and internal medicine (23.7%). This distribution suggests that fast-paced, high-volume environments such as emergency departments may amplify procedural risks, particularly for less-experienced trainees. Aigbodion et al. similarly observed elevated exposure frequencies during high-intensity rotations, particularly in surgery and obstetrics.[22]

Although 89.5% of exposed participants reported using PPE at the time of exposure, the type and completeness of PPE varied. While nearly all students used gloves (100.0%), only 58.8% wore masks and just 16.7% used gowns. These rates suggest partial adherence to recommended protocols, consistent with findings by Lopes et al., who noted that while most healthcare professionals wore gloves and masks, the use of protective gowns, eye shields, and caps was suboptimal.[23] Inadequate PPE usage, particularly in procedures involving splashing or sharps handling, may contribute to unnecessary exposure risk. Regarding contextual factors, students identified extended working hours (17.7%), hierarchical pressure (12.3%), and lack of experience (11.3%) as the primary contributors to exposure. These self-reported drivers align with Pereira et al.'s observations of increased occupational injuries associated with both mechanical and psychosocial risk factors, especially under stressful conditions.[24] Such findings highlight the importance of not only providing adequate PPE, but also fostering a culture of safety, supervision, and psychological support within training environments. While our study did not directly measure training effectiveness, these findings highlight potential gaps between knowledge and practice that warrant further investigation.

Despite existing formal training, as evidenced by participants completing our university's mandatory safety education, which includes:

- Transition to Clinic-Orientation Day (2021 curriculum): Dedicated modules on occupational risks, infection control, and stress management.
- Emergency Department-specific pre-rotation orientations: Covering BBF exposure risks, sharps injury prevention, and PPE protocols.

Our data reveals persistent gaps between knowledge and practice. Specifically, we observed: 56.2% exposure prevalence (higher than global averages); 66.7% exposures in ER (peak risk department); 67.5% recurrent exposures (≥2 incidents); and critically, gown usage at only 16.7% during exposures.

Roberts (2023) emphasizes that sharps injuries persist despite safety training, particularly among early-stage trainees and with non-engineered devices.[25] This aligns with Abere et al.'s (2020) report of 64% exposure prevalence among trained healthcare workers.[26] Further supporting this theory-practice gap, Datar et al. (2022) identified significant discrepancies between knowledge and practice in needlestick injury prevention among medical students mirroring our findings of recurrent exposures (67.5%) and low gown usage (16.7%) despite institutional training.[27]

This theory-practice disconnect suggests that current training may not fully address key areas critical for practical readiness and sustained safety behaviors, including: Real-world stress dynamics: Performance anxiety (IRR=1.85) and hierarchical pressure (IRR=1.61) persist despite didactic coverage, indicating a need for training that simulates and helps manage these psychological stressors in high-stakes environments.

Procedural fluency and mastery: 50% of exposures occurred during venipuncture a basic skill taught early suggesting that initial skill acquisition may not translate into robust, error-proof execution under pressure.

Behavioral sustainability and compliance: Recurrent exposures and consistently low PPE compliance (e.g., gown usage) indicate a failure in the long-term retention and consistent application of safety protocols.

To proactively address these potential gaps and enhance practical preparedness, we propose the following targeted interventions, which warrant further exploration and integration into medical curricula: Immersive ER simulations: Implementing Virtual Reality (VR) scenarios that realistically replicate chaotic trauma bays with bleeding patients could provide a safe environment for students to practice high-risk procedures under simulated pressure, thereby improving performance anxiety and procedural fluency. These interventions require further evaluation in future studies.

"Stress-tested" PPE drills: Conducting unannounced mock exposures or rapid-response PPE drills during clinical shifts could enhance muscle memory and ensure consistent, correct PPE usage under realistic conditions, addressing behavioral sustainability.

Anxiety-inoculation through integrated CBT techniques: Embedding cognitive-behavioral therapy (CBT) techniques from existing stress management modules directly into high-risk procedure training could help students recognize and manage their anxiety in real-time, preventing the stress-injury cycle.

Table 3 shows that 50.2% of final-year medical students in our study screened positive for anxiety, with 7.9% meeting the criteria for severe symptoms. This prevalence substantially exceeds the global average of 33.8% for medical students, as Quek et al. reported in a recent meta-analysis, and is also markedly higher than general population estimates, which range from 3% to 25%.[28,29] Moreover, we observed a statistically significant difference in GAD-7 scores between participants with and without exposure to blood or body fluids: the exposed group reported a mean score of 7.21 (5.38), significantly higher than the unexposed group (5.39 (5.15); p=0.016) (*Table 4*). Although the difference in anxiety severity categories (normal, mild, moderate, severe) did not reach statistical significance (p=0.33), 75% of those with severe anxiety had experienced exposure (*Table 5*), suggesting a vulnerable subgroup.

Although the non-significant chi-square test for categorical anxiety severity and the significant findings from the t-test and regression model may seem contradictory, this reflects the different nature of categorical and continuous variables. Categorizing continuous data into ordinal groups results in loss of information and reduced statistical efficiency[30]. The continuous GAD-7 scores therefore provide a more sensitive assessment of the exposure-anxiety relationship.

This finding aligns with prior research: Gaspar et al. demonstrated that workplace injuries can exacerbate anxiety, forming a "stress-injury" feedback loop.[11] Similarly, Granger and Turner's meta-analysis supports a bidirectional relationship between occupational trauma and anxiety disorders in healthcare workers.[12] These findings highlight the potential need for integrated occupational and psychological safety protocols in medical education, though further multi-center studies are needed to confirm generalizability.

In our study psychological factors, particularly hierarchical pressure (IRR=1.61) and performance anxiety (IRR=1.85), exerted stronger effects on anxiety than physical exposure (IRR=1.34). This suggests that the culture of medical training may pose greater mental health risks than occupational hazards themselves.The 92% increase in anxiety among interns who identified 'anxiety level' as an exposure contributor (IRR=1.92) is consistent with the conceptual framework of the stress-injury cycle proposed by Gaspar et al. (2020), though our cross-sectional design cannot establish causality.[11]

The findings of this study underscore the urgent need to enhance occupational safety education and psychological support within undergraduate medical curricula. The high rate of exposure, particularly during early internship months and in high-intensity departments like emergency medicine, signals a critical gap in procedural preparedness and supervision. Incorporating structured simulation-based training, task-specific risk briefings, and progressive skill acquisition modules may help reduce preventable exposures. Additionally, institutional policies should foster a non-punitive culture of reporting and ensure full compliance with PPE protocols. From a mental health perspective, the association between exposure and elevated anxiety highlights the necessity of integrating routine psychological screening and peer support systems into internship programs. Aligning with the principles outlined in the EU Directive 2010/32, interventions should be proactive, comprehensive, and culturally tailored to mitigate both physical and emotional harm.[31] Ultimately, fostering a culture of safety from the earliest stages of clinical training may yield long-term benefits for both patient care and workforce well-being.

Limitations

This study has several limitations that we acknowledge. First, the cross-sectional design fundamentally limits the strength of causal inferences between blood/body fluid exposures and anxiety levels, preventing conclusions about direct causation or directionality of effect. This inherent limitation may also contribute to the observed modest effect sizes and the lack of statistical significance in certain key associations, such as anxiety severity categories, as highlighted by our findings.

Second, reliance on self-reported data introduces potential recall bias (particularly for exposure incidents occurring early in internship) and social desirability bias in PPE compliance reporting. This self-reported nature, coupled with the absence of objective exposure verification and a lack of triangulation methods (e.g., direct observation, institutional records), limits data robustness and the ability to fully ascertain the true incidence and impact of exposures.

Third, the single-center nature of this study at a medical school constrains generalizability to other cultural or healthcare contexts.

Fourth, the 25.1% non-response rate may affect representativeness, as students with high anxiety might have been less likely to participate.

Fifth, while the GAD-7, although validated for screening, it cannot establish clinical diagnoses of anxiety disorders. Finally, related to the second point, the absence of objective exposure verification could lead to underreporting or inaccurate reporting of exposure frequency and severity.

Sixth, additionally, we did not assess other psychological factors such as depression, burnout, coping styles, or prior psychiatric history, nor did we measure potential confounders such as workload intensity, sleep patterns, caffeine use, or prior occupational safety training, all of which may influence both anxiety levels and exposure risk. Therefore, the stress-injury cycle framework, while conceptually relevant, remains hypothetical in the context of our study and requires further investigation with longitudinal designs. Despite these limitations, our findings align

with global evidence on occupational risks in medical training and provide actionable insights for educational reform.

Therefore, our prevalence estimates should be interpreted with caution, and the findings regarding exposure frequency and timing may be subject to recall error.

Conclusion

This study found that over half of final-year medical students (56.2%) reported exposure to blood or body fluids during clinical training, with multiple incidents reported by 67.5%. Venous blood draws, emergency department rotations, and early internship months emerged as key risk contexts. Despite comprehensive safety training (including 2021 curriculum modules and ER-specific orientations), incomplete PPE adherence (gown use: 16.7%) and contributing factors like hierarchical pressure (21.9%) persisted. We found that exposure was significantly associated with elevated anxiety scores (mean GAD-7: 7.21 vs. 5.39, p=0.016), indicating a dual physical-mental health burden. These findings suggest a need to further examine and potentially adapt existing training approaches to better integrate stress-adapted simulations, real-time compliance feedback, and psychological safety practices. These findings generate hypotheses about potential curricular improvements and suggest the need for further research with objective measures of training effectiveness.

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Original Article

'To Love the Patient': A Qualitative Study of the Role of Mentorship as Part of Medical Education in Rwanda

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Abstract

Background: Medical education in Africa is changing rapidly as 21st century innovations such as e-learning, expansion of simulation laboratories, and other technologies are implemented at universities across the continent. Alongside these efforts, instilling in medical students an understanding of the larger social, economic, cultural, and political dynamics that influence health is essential. In this study, we sought to understand medical students' experience with the novel curriculum at the University of Global Health Equity (UGHE) in Rwanda, with a focus on the role of mentorship. **Methods:** We conducted a qualitative, in-depth interview study with 18 medical students who had experienced the liberal arts curriculum of UGHE. Interviews were conducted by three members of the research team until theoretical saturation was reached (n=18). The constant comparative method of qualitative data analysis was employed to characterize recurrent themes. **Results:** Three recurrent themes emerged pertaining to Dr. Paul Farmer's impact as a role model for medical students: 1) he encouraged systems thinking in his students, 2) he taught students "to love the patient," and 3) he used practical examples to inspire action. Medical students described the medical education they received as a "mind opener." Participants recounted how Dr. Farmer's mentorship fostered their own confidence in becoming compassionate physicians who would inspire systemic change. **Conclusion:** Our findings highlight the role that mentors can play in the development of future physicians and suggest that integrating effective mentorship into the medical school experience can affect medical students' approach to patients and motivation to pursue systems change.

Introduction

The extensive benefits of both formal (deliberate programs with structured curricula) and informal (spontaneous mentor-mentee connections) mentorship in medical schools are well-documented in a variety of high-income settings.[1-3] Formal programs may be led by student advisors or counselors and often include official curricula and planned activities consistent across a mentor-mentee cohort. Informal, spontaneous mentor-mentee connections provide mentees with informal guidance throughout their development and may be more flexible and individualized than official mentorship.[3,4] Consistent with Social Learning Theory,[5] which suggests that people learn from observing others and emphasizes the importance of modeling behavior and reinforcement in learning, empirical literature[2-4] indicates that mentorship in which students may observe, imitate, and have an emotional connection with mentors can be pivotal to students' learning. Effective mentorship has been shown to foster skill development, meaningful participation in research, personal and professional development, and guidance regarding career choices.[1-3]

Despite potential benefits of effective mentorship to future physicians, worldwide, few studies have been conducted about mentorship in medical education in low-income countries especially in sub-Saharan Africa (SSA). One systemic review by Atlas and colleagues[9] advocated for enhanced mentorship in medical schools, but did not include empirical evidence from SSA. Studies that have included SSA[6-8] have largely focused, with one exception[7] on non-physician health professionals (e.g., nurses, social workers) and have not examined mentorship as a part of medical school education. A review by Feyissa and colleagues[6] concluded that embedding mentoring in hospitals, clinics, and laboratories could improve the clinical management of infectious diseases and maternal health concerns by non-physician providers; Manzi and colleagues[7] also evaluated mentorship and coaching as a part of health systems strengthening interventions in five countries of SSA and found improvements in clinical practices of nurses and physicians. Although helpful, this literature has not examined mentoring within the context of medical school education in SSA,[10,11] a gap which this study sought to address.

As the first Chancellor of UGHE, Dr. Farmer taught the early cohorts of the undergraduate medical degree program (MBBS). Dr. Paul Farmer has been one of the world's most well-recognized and respected global health professionals. An advocate and pioneer in global health who championed the most prolific advancements in health equity of the 20th and 21st centuries, Dr.

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Paul Farmer has been acknowledged as a role model for healthcare workers and global health professionals worldwide.[13] He stood for health equity, and social justice, advocated for preferential treatment for the poor, and prioritized building educational opportunities for young medical professionals to adopt the same principles. UGHE, located in Butaro, Rwanda, was born from these values, which he shared with his colleagues at Partners in Health, one of UGHE's founding institutions.

Along with his colleagues,[12,14] Farmer[15] emphasized the need for medical students to understand the larger social, economic, and political forces that contribute to health and well-being. Following these priorities, the liberal arts portion of the MBBS curriculum emphasized topics such as anthropology, critical thinking and scientific reasoning, African history, political economy, and information technology and communications.[12] Furthermore, the MBBS curriculum remains embedded in a social medicine framework, and courses are delivered with an inquiry-based pedagogy. At UGHE, faculty are enlisted to not only guide MBBS students through the liberal arts and biomedical science curriculum but also to encourage them to ask questions, explore different perspectives, work closely with peers, and foster mentoring relationships with faculty. This approach is distinct from the hierarchical, biomedical approach that is common in medical schools in Africa.[16]

Accordingly, this study aimed to explore the experiences of medical students at UGHE with the liberal arts curriculum with focus on mentorship. To meet our objective, we conducted in-depth interviews with MBBS students at UGHE. Without prompting, the influence of Dr. Paul Farmer's approach to mentorship of MBBS students emerged as a prominent theme during the study. The aim of this paper was to explore the experience of medical students with such mentorship in the context of their MBBS medical education in the low-resource setting of Rwanda. Findings may be useful to medical educators and health policy makers seeking to strengthen medical education in Africa.

Methods

Setting

The University of Global Health Equity (UGHE), located in the rural northern province of Rwanda, was founded in 2014 through dedicated collaboration between Partners in Health, the government of Rwanda, and other partners. Born from Dr. Paul Farmer's dream of advancing health equity through education, UGHE is dedicated to building a generation of professionals in global health dedicated to sustaining equitable health systems. While the medical school curriculum does not include an official mentorship program, UGHE's liberal arts approach to medical education emphasizes the importance of collaboration and encourages engagement between faculty and students.

Study Design and Sampling

We conducted a qualitative, in-depth interview study to explore medical students' experiences with the liberal arts phase of their curriculum at UGHE. We randomized all students who were enrolled in the MBBS program at the time of the study (total=215); we sought to attain a sample that included adequate numbers from different academic years, nationalities, and genders as we anticipated these variables may influence students' experience in the MBBS program.

In order to ensure breadth relative to these potentially influential characteristics, students who were in the same academic year, gender and nationality as multiple participants who had already been chosen and included in the study were excluded. We also excluded the four students with whom we pretested the discussion guide before beginning data collection.

Sample size was determined by theoretical saturation, i.e., when no new concepts emerged from successive interviews.[17] In order to assess theoretical saturation, the research team discussed the emergence of new ideas after reviewing and coding each new transcript. After coding the 18th interview, we agreed that we had not found or coded a new concept in the last few interviews and hence determined that we had reached theoretical saturation. This sample size is consistent with writing by Dworkin[18] addressing appropriate sample sizes for in-depth interview studies.

Data Collection

In-depth, semi-structured interviews were conducted in-person (22%) and online (78%) by three members of the research team (COS, EAL, CUG) between July and September, 2024. Because the modality of data collection (in-person versus online interviews) may have influenced students' responses, we examined the breadth and depth of content between the two types of interviews. No systematic patterns based on modality were detected.

Open-ended, grand tour questions and related probes were used to explore students' experiences.[19] Core domains of the interview guide included students' experiences with liberal arts curriculum, campus culture, and relationships with peers, faculty, and mentors. An example of a grand tour question utilized is: Tell me, in your own words, what did you gain from the liberal arts (or prep) phase of the MBBS? We also included probes to delve more deeply into ideas raised by participants related to content of classes, teaching style, connections between instructors and students, and campus culture.

Interviews lasted an average of about 30 minutes, and were audio recorded after obtaining written informed consent from participants. The software Rev was used to transcribe interviews, and all transcriptions were checked for accuracy against the corresponding recording.

We acknowledge the potential for Hawthorne bias, i.e., participants changing their behavior or responses on account of being observed during data collection.[20] To mitigate the potential for this bias, we assured participants anonymity and confidentiality and also worked to establish a comfortable

rapport with participants by beginning with general, factual questions such as "How did you first hear about the MBBS at UGHE", and "How did you decide to apply?" Furthermore, we assured participants that the purpose of the study was to learn from their experiences in an attempt to make them feel at ease during interviews. [21]

Data Analysis

We used the constant comparative method of qualitative data analysis in our study.[17,22] The diverse team of researchers (COS, EAL, CUG, EHB) independently read early transcripts, became familiar with the data, and developed the code sheet, inductively. We identified concepts that aligned with chunks of data and assigned them codes. Similarly coded data were constantly compared throughout the process to further define the meaning of each concept.

In accordance with thematic analysis, we met periodically throughout data collection to discuss patterns, interesting phrases, and emerging themes. The four researchers coded each transcript in pairs and used negotiated consensus to resolve any disagreements or discrepancies in the initial coding. After coding each transcript, the code sheet was updated to include new codes, group overlapping codes together, or refine the definition of existing codes, as is recommended in qualitative data analysis.[23]

For example, when a participant mentioned 'gaining wisdom,' it was included in the description of the code 'broader perspective' as it was interpreted as expanding the 'broader perspective' concept rather than introducing a new theme. We repeated this process with each interview transcript until we arrived at a final code sheet. The final code sheet, consisting of 42 codes, was then used by two coders to re-code all transcripts.

Although we did not calculate inter-rater reliability, differences in coding were resolved through negotiated consensus by the two initial coders and by all four members of the research team when necessary. Researchers handled discrepant cases by discussing their reasoning for assigning a particular code, weighing each explanation, and coming to an agreement before assigning a final code.

We used Dedoose to organize transcripts and facilitate data access and analysis, and we kept an audit trail to document conceptual changes throughout the process.

Ethical Considerations

Ethical clearance was granted by the University of Global Health Equity (UGHE) Institutional Review Board (IRB) (IRB number: UGHE-IRB/2023/007).

Reflexivity Statement

The authors include three former UGHE master's students (COS, EAL, CUG) who completed their master's programs in August, 2024 and one faculty member (EHB) with teaching experience in the UGHE MBBS program. The former master's students were not affiliated with the MBBS program during their studies. To mitigate potential bias, the author with a teaching role in the MBBS program did not participate in interviewing. Interviews were conducted by researchers who were not involved in participants' assessment or supervision, and all student data were anonymized during transcription. The research team regularly reflected on their own biases and the way in which their connection to UGHE could have influenced the project including data collection and analysis. We held periodic meetings in which we looked for disconfirming evidence and discussed reflections and feedback to mitigate bias.

Results

Sample

The study included 18 participants, evenly split by gender (50% male, 50% female). Regarding the year of the MBBS program, 33.3% were first-year students, while the remaining participants were distributed equally across the third, fourth, and fifth years (22.2% each). In terms of nationality, the majority (66.7%) were Rwandan, followed by Ugandan participants (11.1%). The remaining participants came from the Democratic Republic of Congo, Tanzania, Lesotho, and Malawi, each representing 5.6% of the total sample (***Table 1***).

Three recurrent themes emerged (***Figure 1***): 1) systems thinking, 2) empathy and compassion, and 3) inspiring action. These themes were prominent and recurring in discussions with students who were exposed to Dr. Farmer, and references to his influence were made by students across cohort years. Students of different nationalities did not differ markedly in how they discussed the reported themes. Below, we describe each of these in more depth and provide verbatim quotations to illustrate each theme.

Table 1. **Summary of Participants' Demographic Characteristics.**

Category	Subcategory	n (%)
Gender	Men	9 (50.0%)
	Women	9 (50.0%)
Academic Year	1st Year, Prep Phase	3 (16.7%)
	1st Year, 1st Semester	3 (16.7%)
	3rd Year	4 (22.2%)
	4th Year	4 (22.2%)
	5th Year	4 (22.2%)
Nationality	Rwandan Students	12 (66.7%)
	International Students	6 (33.3%)

Systems thinking

Students described that Dr. Farmer emphasized understanding patients beyond their clinical symptoms by exploring the social determinants of health, health inequities, and structural barriers to health care and other basic needs. The students characterized the liberal arts portion of their curriculum, in which Dr. Farmer described the role of a medical doctor in relation to social determinants of health, culture, and history, as a 'mind opener.'

> *My prep (liberal arts) phase was like a mind opener to the medical field and to social medicine in terms of the history*

> *and really what is the role of a medical doctor. We talked about what was the call for doctors especially in relation to health with great people that taught us such as Paul Farmer. We also discussed the key figures that go into the practice of medicine or into global health… Everything we talked about was about culture… exposing us to the culture that you should expect in medical school and even life after that.* (ID 14, 3rd year male international student).

Empathy and compassion

Students described being inspired by the value system of empathy and the love of patients from which Dr. Farmer acted. Participants reflected on how their perspectives developed regarding the role of medical doctors in the lives of patients after learning from Dr. Farmer. He emphasized the "human aspect" and the "caring aspect" of medicine in his lessons and encouraged students to love their patients as they would members of their own family.

> *I'm super grateful that I got to take social medicine and medical anthropology with Professor Paul Farmer. It was incredible in the sense that we got to hear about human nature… the human aspect of medicine, the caring aspect, the empathy that many people lack in going into medical school.* (ID 11, 3rd year female international student).

Students also reflected on how meaningful it was to learn about health inequities before they started the basic sciences part of the curriculum; they said watching Dr. Farmer taught them how to interact with their patients.

> *We had many classes that were led by Dr. Paul Farmer. [In the] clinical cases, [we learned] how we should interact with the patient. So before studying medicine, before studying BMS (biomedical sciences),[we learned] all about caring for the patient, how we can [get to]know about the patient … and about social medicine … social determinants of health … gender equity and equality, [and] health inequities within our local areas and within our healthcare systems. That's where we started loving medicine.* (ID 5, 3rd year male Rwandan student).

Students remembered that Dr. Farmer expected them to respond to patients' social needs as well as their medical ones, for instance instructing them to think about and provide patients with food alongside their medications if they were in need.

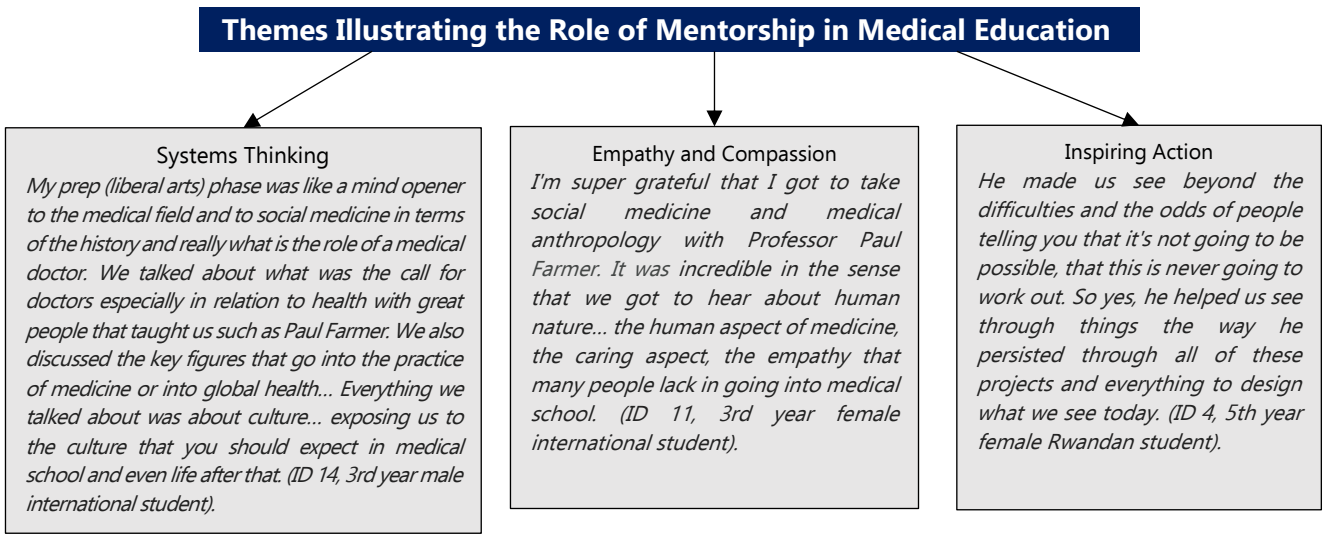
> *Thank God that I got to meet the late professor Paul Farmer… He always showed us, if your patients do not have food and you are giving them medications and you know that what you're doing to them, they're going to need food. [In addition to treating the patient,] you are in the position of also providing food.* (ID 4, 5th year female Rwandan student).

Inspiring action

In describing their experiences being taught by Dr. Famer, students emphasized the inspirational effect of seeing Dr. Farmer teach with practical examples, illustrating the role he hoped they would assume as medical doctors. By sharing and showing his own experiences and those of his colleagues, he inspired students to envision themselves as agents of change in the health sector. Dr. Farmer's persistence in his own career helped students see beyond the "difficulties and the odds of people telling you that it's not going to be possible."

> *He made us see beyond the difficulties and the odds of people telling you that it's not going to be possible, that this is never going to work out. So yes, he helped us see through things the way he persisted through all of these projects and everything to design what we see today.* (ID 4, 5th year female Rwandan student).

Figure 1. **Summary of Themes Illustrating the Role of Mentorship in Medical Education.**



The way Dr. Farmer had empathy for patients and treated them with respect as well as his contributions to the remarkable recent improvements in Rwanda's healthcare system showed students that it was possible to be a caring physician who also fosters systemic change.

> *Then looking at Dr. Paul Farmer working alongside Dr. Agnes to bring Rwanda back from ashes to where it is today in terms of the health system and everything. I learned a lot of key lessons.* (ID 11, 3rd year female international student).

Several participants reported that the principles they associated with Dr. Farmer's mentorship continued to inform how they conceptualize patient care, treat patients, interact with health systems, and imagine their role as future physicians. However, some international students noted limitations in their application of clinical skills early in their education because of the language barrier between themselves and their patients and Rwandan physician mentors. This may have limited the application of the lessons learned from mentors but may have improved over time as their language skills developed.

Discussion

In seeking to explore the experiences of medical students with a liberal arts approach to medical education at UGHE, the influence of Dr. Paul Farmer as a mentor for MBBS students emerged as a major theme. We did not ask specifically about Dr. Farmer during interviews; however, participants identified that his commitment to impart knowledge on systems thinking, share the values of empathy and compassion from which he treated patients, and inspire action in his students made him a role model for many.

Our findings revealed the holistic development of future physicians through mentorship like the systems thinking and "loving the patient" that Dr. Farmer inspired through his connections with students and practical examples he provided. While we recognize Dr. Farmer as an example, the discussion of mentorship aims to capture the positive impact that any dedicated mentor can have on their students' development. We recognize mentorship is only one contributing factor to medical students' development and other inputs are also critical; nevertheless, our findings demonstrate that participants perceived Dr. Farmer's mentorship to be deeply influential in shaping their professional values and approaches to patient care according to their testimonies.

Previous studies in high-income countries have documented the many benefits of mentorship in medical education, but this is the first study of which we know that characterizes the qualitative impact of mentorship on medical students in a low-income country. [3,23] Our findings are notable in this setting as previous literature has described a lack of personnel and institutional support needed for providing effective mentorship opportunities in low-income countries.[11] Despite challenges to implementing effective mentorship in the medical field in low-income countries, which include limited institutional resources and support, low availability of mentors, and paternalistic pedagogy,[11] our findings show the potential for mentorship to be embedded within course pedagogy and classroom culture.

The MBBS program's inquiry-based pedagogy, anchored in principles of social medicine, encourages such interactions between faculty and students and is relatively inexpensive and thus feasible in low-resource settings. It requires adequate training of faculty and a supportive culture that endorses critical thinking but does not require added resources in terms of laboratories, space, or medical equipment. Thus, with adequate commitment, adopting a mentorship approach that encourages critical thinking, reflection, and connections between faculty and students is a transferable intervention that could serve as a relatively inexpensive, sustainable approach in medical education in low-resource settings. Encouraging faculty to adopt this approach might also facilitate dynamic mentor networks in which students receive guidance from a range of professionals, an approach Ramani and colleagues[24] have suggested as a critical shift from dyadic formats that rely on a single role model.

Our study should be viewed in light of the following limitations. First, this qualitative study was undertaken at a single university. Although we continued data collection until we achieved theoretical saturation, results in other settings may differ. Second, using a qualitative study, we were unable to test hypotheses or generalize about the impact of such mentorship on medical students broadly. Nevertheless, we employed several techniques recommended by experts in qualitative research[25-27] to enhance the trustworthiness of our findings.[25,28] Credibility was supported through researcher triangulation, as multiple researchers coded transcripts independently and came together to discuss emerging interpretations. All interviews were coded independently and then together by two members of the research team. We ensured dependability through the consistent use of a shared codebook and by documenting decisions in an audit trail. Confirmability was addressed as the research team consisted of multiple researchers with varying backgrounds. We included multiple researchers with varying backgrounds on the research team, we ensured the consistent use of the discussion code, and all interviews were coded independently and then together by two members of the research team. Additionally, audiotaped interviews were professionally transcribed, we performed comprehensive quality checks on each transcript, and we retained an audit trail to document analytic decisions. A third limitation is the lack of data on longer-term outcomes such as physician practice patterns or patient outcomes, and we did not have adequate resources to triangulate our findings with data from faculty members' or patients' experiences. Longer-term studies of clinical impacts of mentorship are warranted. Last, while Dr. Farmer's contributions to global health and medical education are undeniably transformative, relying heavily on a single role model has limitations. Overemphasizing one individual's mentorship approach may inadvertently overshadow the diverse perspectives and strategies necessary for comprehensive medical training.[29] It also inherently limits the generalizability of the findings of this study, and efforts to replicate the influence of Dr. Farmer's mentorship would have to be adjusted and tailored to fit the unique circumstances of other

settings. While we highlighted Dr. Farmer's influence as a mentor in this study, future studies would benefit from examining the impact of a wide range of role models. Longitudinal studies that explore the long-term impacts of mentorship on clinical practice and patient outcomes in a variety of geographical and cultural contexts may be particularly relevant.

Our findings highlight the key role that mentors such as Dr. Paul Farmer can play in the personal and professional development of future physicians despite their relevance to a single individual and particular university setting. Even after his death, his students described that his mentorship continued to shape the way they treat patients, interact with health systems, and imagine their role as future physicians. Physicians and global health professionals committed to fostering health equity and social change may be able to widen their impact by high-impact mentoring practices employed with the next generation of health professionals. Similarly, medical schools and educators that seek to transform the delivery of health care may benefit from considering educational programs and policies in ways that not only allow for but also institutionalize effective models of mentorship. Implementing mentorship approaches that emphasize systems thinking and relational engagement may bolster the compassionate care of patients and inspire physicians to effect systemic change, although further research is needed to assess their effectiveness in other contexts.

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Applying to US Medical Schools as a Couple: Our Experience

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The Experience

By the time we were ready to apply to medical school, we were four years into our relationship. We were both excited to pursue our dream of becoming physicians but felt uncertain about how the process might affect our support system. Despite the significant challenges students face during medical school and the importance of social support in higher education,[1,2] there are no clear guidelines for couples applying to medical school together. As two successful applicants (M.D.B. and Q.N.), we share our experience, strategies, and advice for others navigating this process as a pair (***Figure 1***).

Before applying as a couple, it is important to understand the basic medical school application process, timeline, and required materials.[3-5] Consult your university's pre-med advisors and mentors who know you well for help creating your application. Think about which programs align with your goals and strengths, prioritizing home-state schools and programs where either partner has strong ties (family, school enrollment, prior residence, etc.).

After finalizing our individual school lists, we discussed where to apply as a couple. While our goal was to attend the same program, we considered the possibility of attending different schools. We decided not to consider programs more than 3 hours apart by car, train, or direct flight, and found it helpful to organize schools into five tiers (***Figure 2***).

Turning Point 1: Submitting our Applications

After months of hard work drafting our applications, we faced a new challenge: waiting patiently for programs to respond. Applying alongside your partner is unique because you are intimately aware of each other's progress throughout the admissions cycle. Interview invites can be twice as exciting, while rejections can sting twice as much, especially when one partner receives more interest than the other.

Figure 1. **Meet the Authors.**

If one partner receives an interview or acceptance, the other should consider sending update letters to nearby schools. When Q.N. was accepted to a Florida program, M.D.B. sent updates to multiple programs nearby. Reiterating interest seemed to pay off, as M.D.B. received an interview invite from one of the schools

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weeks later. It is generally acceptable to send updates to multiple programs if they welcome communication, but avoid sending letters of intent – in which a commitment is made to attend upon acceptance – to multiple schools.

Turning Point 2: Making a Decision

By the time interviews concluded in April, there was no overlap in our acceptances or waitlists. Realizing we could not attend the same program, or even live together during medical school, was one of the hardest moments of the cycle. We also needed to decide whether we wanted to risk waiting for Q.N. to be offered a position from the waitlist at an Arizona school – our home state – or commit to moving to Florida. After considering our options, we decided to commit to our Florida schools. We appreciated their confidence in us and wanted to ensure we could attend medical school in the same state.

Throughout this process, maintaining open and honest communication with your partner is key. It is important to establish your individual goals and priorities early and communicate frequently. Here are some hard questions we each asked ourselves:

1. Is getting accepted into medical school more important than staying close to my partner?
2. Am I willing to decline an acceptance at one of my top-choice programs for my relationship?
3. How confident am I that my partner will be in my life for the next 5 years? 10 years?
4. How far apart from my partner am I willing to be?
5. Would I enjoy attending the same program as my partner? Or would I prefer to have my own experience?

The answers to these questions will vary significantly between relationships because each one is unique. Be cautious with allowing your goals as a couple to dictate your goals as individuals. No matter how confident you are in the longevity of your relationship, it is crucial to consider your happiness at a program if your relationship does not work out.

***Figure 2*. Our Five-Tier System for Prospective Medical Schools.**

Unfortunately, some applicants may not be accepted during their first cycle. If you are considering reapplying, take time to reflect on your application and identify areas for improvement. If one partner is accepted and the other is not, reapplying to that program or nearby schools in the next cycle remains a strong option. Having a significant other at the school can strengthen your application by demonstrating genuine interest and offering valuable insight into what medical school is really like.

Turning Point 3: Adjusting to Medical School & Key Takeaways

While we may not have known it when applying, attending different schools was best for us. We have gotten the opportunity to meet twice as many people and grow as individuals. During the week, we have plenty of time to focus on our school work, and we make the 2-hour drive nearly every weekend to visit each other. We are currently completing our third-year clerkships, recently got engaged, and are beginning to think about applying to residency in the 2027 NRMP couples match.

Our key takeaways from this process, and advice from three admissions professionals at one of our medical schools, are shown in ***Table 1***. While the advice we received from admissions professionals largely aligned with our experiences, it also highlighted potential challenges such as how relationship changes might affect class dynamics.

***Table 1.* Key Takeaways for Couples Dual-Applying to Medical School.**

Medical Student Advice	Admissions Professional Advice
1. Seek advice from trusted mentors	1. Remain professional in all communications
2. Evaluate programs of interest individually before discussing as a couple	2. Visit schools of interest together to inform your decisions
3. Maximize your ties when building your school list	3. Be objective: the goal of the admissions team is to admit students based on merit
4. Discuss the possibility of attending different programs, and define reasonable distance	4. Understand that relationships change over time & breakups could affect class dynamics
5. Update schools where your partner was accepted, plus any others nearby	5. Consider communicating your relationship to programs so they can document your interest in attending together
6. Avoid the cycle of comparison	6. Utilize letters of interest and intent judiciously
7. Rejection is normal – but it still stings	7. Avoid compromising professional goals or interests for your partner
8. Be open and honest with your partner, you have each other to lean on	
9. The process is difficult, but worth it!	

Conclusions

Our experience highlights the importance of setting realistic expectations, considering logistics such as distance and travel, and remaining resilient when applying to medical school as a couple. Honest, consistent communication helped us make informed decisions and support each other. Though stressful, the process was worth it. We hope our insights offer practical guidance and reassurance. You are not alone, and we are rooting for you!

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IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Experience

Implementing a Student-Led Dermatology Trainee Advocacy Day in Kentucky

Alicia Fields.[1]

The Experience

With the core curricula of medical schools focused on the foundational sciences and with enormous pressure on students to successfully navigate standardized exams, topics such as health care policy and advocacy may not be sufficiently explored during physician training.[1] Meanwhile, many patients continue to suffer tremendous health inequities.[2] Kentucky has one of the highest rates of skin cancer in the nation among many other stark health disparities.[3] At the University of Kentucky College of Medicine (UKCOM), students designed a trainee-developed social outreach event to bridge this awareness gap through a highly accessible virtual statewide conference. In addition to providing a platform for dermatologists and medical trainees, the event introduced participants to relevant themes and rising concerns in the field. This initiative illustrates how I transformed an idea into action.

The first Dermatology Trainee Advocacy Day was held in Massachusetts in 2021 led by Dr. Avery LaChance, Director of Health Policy and Advocacy at Brigham and Women's Hospital. Like Kentucky in 2024, additional states have joined each year. I first learned about this event through the Dermatology Interest Group Association's Instagram page, where an advertisement for a 2023 event in another state was posted. I attended, and Dr. LaChance was one of the speakers. A quote that she had in her presentation stuck with me. "Unless someone like you cares a whole awful lot, nothing is going to get better. It's not." I reached out to Dr. LaChance to see if Kentucky had ever planned an advocacy day and, if not, how I could assist in making this happen. Several months went by before I received an email from a dermatology resident on the national planning team. We set up a time to talk and she told me how excited she was for me to be the chair of the planning committee for Kentucky's first event. It was at that moment I realized that I had a lot of work to do.

I started by working with campus leadership and building a small team of medical students from the various UKCOM campuses who were interested in advocacy, the field of dermatology, or both. Early planning involved forming partnerships with the Kentucky Dermatological Association (KDA), Kentucky Medical Association (KMA), and determining advocacy topics. Working with a faculty mentor, we decided to include the following topics: Advocacy 101, Advocacy in Dermatology, Legislative Update, Sunscreen Laws in Schools, Tanning Restrictions for Minors, and Insurance Coverage for Skin Cancer Screenings. I then started reaching out to experts in the field to see if they would be willing to speak at our inaugural event. I coordinated conference logistics, created a website for registration and speaker information, and served as the event's host. In the pilot year

Figure 1. **Proclamation from Kentucky Governor Andy Beshear Recognizing June 16, 2025, as Dermatology Trainee Advocacy Day.**

Proclamation

by

Andy Beshear

Governor

of the

Commonwealth of Kentucky

To All To Whom These Presents Shall Come:

WHEREAS, Dermatologists, dermatology trainees, medical students, other healthcare professionals, and stakeholders are working together to bring awareness of important issues in dermatology to legislators and citizens in the commonwealth; and

WHEREAS, Kentucky experiences significant healthcare disparities—especially in rural and medically underserved communities—which extend to the field of dermatology; and

WHEREAS, Advocacy efforts by dermatology trainees—including education, community outreach, and legislative engagement—enhance the future of dermatologic care by shaping well-rounded physicians committed to advancing a more inclusive healthcare system; and

WHEREAS, The observance of Kentucky Dermatology Trainee Advocacy Day provides citizens and legislators with the opportunity to advocate for the field of dermatology – a medical specialty in which physicians diagnose and treat more than 3,000 conditions of the skin, hair, and nails in people of all ages;

NOW, THEREFORE, I, ANDY BESHEAR, Governor of the Commonwealth of Kentucky, do hereby proclaim June 16, 2025, as

DERMATOLOGY TRAINEE ADVOCACY DAY

in Kentucky, and encourage all Kentuckians to recognize the positive impact advocating for these important issues will have on the lives of the citizens of the Commonwealth of Kentucky.

DONE AT THE CAPITOL, in the City of Frankfort the 21st day of May, in the year of Our Lord Two Thousand Twenty-Five and in the 233rd year of the Commonwealth.

ANDY BESHEAR
GOVERNOR

Michael G. Adams
Secretary of State

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***Figure 2*. Medical Students Teaching Elementary Students about Sun Safety and Skin Cancer Prevention.**

approximately 40 dermatologists and medical trainees registered for the event including students from all three medical schools in Kentucky. Participants came together to explore specific policy issues including prior authorizations delaying care and often leading to treatment abandonment,[4] Kentucky not having legislation regarding sunscreen use in schools,[5] and Kentucky Revised Statutes Chapter 217.922 allowing children under age 14 to indoor tan when accompanied by a parent/guardian while ages 14-18 can indoor tan with written consent from a parent/guardian.[6] Following the conference, I was invited to speak at the KDA Annual Meeting, where I provided an overview and highlighted the advocacy efforts of medical students in Kentucky.

For the 2025 event, a second-year student stepped into the chair role, leading our focus on rural dermatology and the healthcare disparities affecting these underserved communities. Our speakers included a UKCOM graduate who is currently completing his dermatology residency at a rural program, representatives from the Melanoma Research Foundation and Improving Melanoma Prevention through Awareness, Care and Teaching (IMPACT Melanoma), and an advocacy overview from the KMA. Following a lively discussion, students are in the early stages of introducing legislation into the 2026 legislative session to address the issue of sunscreen use in schools. A student-authored resolution, "Sun-safe Behavior in School-aged Children" was recently submitted to the KMA, with the Board of Trustees recommending its adoption. Of special note, Governor Andy Beshear issued an official proclamation recognizing June 16, 2025, as Dermatology Trainee Advocacy Day, honoring the dedication of medical trainees to improve health care access, advance skin cancer prevention, and shape policy that affects dermatologic care across the state (***Figure 1***).

Events such as this one not only expose medical students to the challenges that may await them in a desired specialty but also show that there are ways to bring about positive change. This also served as an excellent networking event by connecting like-minded medical students with key stakeholders. UKCOM students continue to advocate for the topics covered during advocacy day and many others by attending the 2024 KMA Physicians' Day at the Capitol, interacting with legislators, and writing resolutions for the KMA. Students are also educating children in Kentucky schools about sun protection and skin cancer prevention (***Figure 2***). I believe the work of enthusiastic medical students can promote the adoption of lifelong health habits that have the potential to reduce skin cancer rates.

This event was a collaborative effort involving many people enthusiastic about advocacy and the well-being of Kentuckians. My hope is that it emphasized the importance of advocacy while also starting conversations about issues specific to Kentucky that, in conjunction with the KMA and KDA, we can work to address in the future. Advocacy does not require an advanced degree as anyone can play a role in helping to shape health policy. With support from campus leadership, buy-in from key stakeholders, and a team of passionate medical students, meaningful initiatives can be launched that create lasting impact on both health policy and the next generation of physicians. Using Kentucky's event as a guide and inspiration, student-led advocacy efforts can be developed in other locations or specialties.

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Experience

Contributing to Evidence Synthesis as a First-Year Medical Student: My Experience with Cochrane Crowd

Shivansh Pande. [1]

The Experience

Background

The following article describes my experience contributing to evidence synthesis during my first year of medical school through opportunities available via Cochrane Crowd and Engage. Evidence synthesis forms the backbone of evidence-based medicine and improves patient outcomes.[1] Systematic reviews and meta-analyses of randomized controlled trials (RCTs) constitute the highest level of medical evidence.[1] The Cochrane Collaboration (established in 1993), named after Archie Cochrane, is a leading global organization that facilitates the publication of high-quality systematic reviews of medical interventions and tests, providing clinicians and patients with the information needed to make healthcare decisions.[2]

Cochrane Crowd is a web-based portal launched in 2016 that hosts microtasks such as screening for RCTs and extracting Population-Intervention-Comparison-Outcome (PICO) elements. Cochrane Engage, in contrast, is a volunteer platform where researchers and contributors in biomedical fields offer their expertise to complete tasks posted by other members. These include acting as a patient or public reviewer for Cochrane protocols and reviews, translating plain-language summaries into vernacular languages, and collaborating on evidence synthesis.[3–5]

Individuals from diverse backgrounds can contribute to advancing science as "citizen scientists," assisting in the extraction, analysis, and interpretation of data.[5] Cochrane Crowd offers an accessible entry point regardless of prior research experience. This was particularly appealing, as it allowed me to gain exposure to the fundamentals of evidence-based medicine while contributing to evidence synthesis.

Personal Experiences

My experience with the Cochrane ecosystem began by creating an account and navigating to the Crowd platform. There, I accessed concise visual modules covering key concepts in health research, study designs, and an introduction to the CONSORT statement. I followed the student learning pathway, which was clear and accessible, using practical examples to explain core concepts. After completing the basic training, I proceeded to volunteer tasks, each preceded by a brief instructional module.

Following training, I performed tasks including screening abstracts for possible RCTs or quasi-RCTs, extracting PICO elements, and classifying records from ClinicalTrials.gov and the International Clinical Trial Registry Platform (ICTRP). The primary task—classifying studies as RCTs—required determining whether a record met methodological criteria or should be excluded. An option to skip uncertain records was available. A reference guide listing acceptable study types, including RCTs, quasi-randomized studies, follow-up data from RCTs, and cost–benefit analyses of previously studied interventions, was provided and frequently consulted to ensure accurate classification.

Reviewing abstracts across diverse fields such as immunology, genetics, oncology, and hospital medicine was particularly valuable. I recall reviewing studies on soleus exercises in diabetes and remote ischemic limb conditioning in stroke, which prompted further independent reading.

A notable task type is the "Screen4Me" initiative, in which volunteers screen records for specific systematic reviews or protocols. Volunteers who complete more than 250 records may receive named acknowledgment in the resulting publication. Additional periodic tasks are posted on the platform, each accompanied by structured training. Global screening challenges are also organized, enabling contributors worldwide to collaboratively process large volumes of studies; I participated in several of these activities.

Overall, I screened 693 research records in August 2025 through Cochrane Crowd. I also contributed as a public reviewer for a Cochrane protocol, focusing on improving readability from a patient perspective, after applying through Cochrane Engage. These activities allowed me to accumulate membership points and obtain Cochrane membership for one year, providing formal recognition of my contributions (***Figure 1***).

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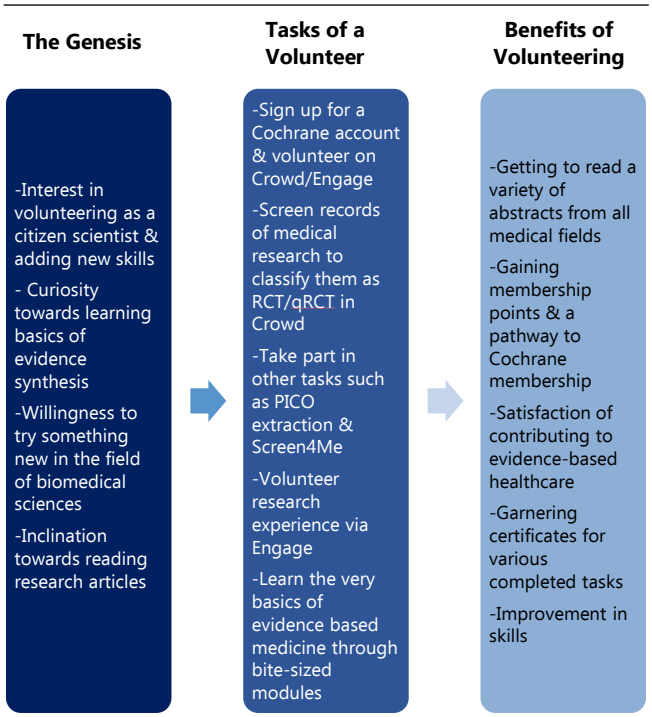
Figure 1. **Volunteering for various tasks on Cochrane Crowd and Engage: My Experience.**



Strengths & Role of Crowdsourcing in Evidence Synthesis

Studies classified as RCTs by at least four independent reviewers are included in the Cochrane Central Register of Controlled Trials (CENTRAL).[3] CENTRAL is a key resource within the evidence synthesis ecosystem, serving as a comprehensive database for systematic and Cochrane reviews.

Noel-Storr et al.[3] reported a sensitivity of 99.1% for public contributors identifying RCTs based on abstracts, supporting the reliability of the crowdsourcing model. In cases of disagreement, records are reviewed by the Cochrane Crowd team to ensure that eligible studies are not excluded.

In 2020, approximately 100,000 bibliographic records were screened annually by Crowd volunteers, while Cochrane's machine learning–based classifier processed an additional 200,000 records, resulting in approximately 300,000 studies assessed.[3] These figures underscore the complementary role of human contributors and automated tools in managing the growing volume of biomedical literature, estimated at approximately 1.5 million articles annually.[6]

Crowdsourcing has also demonstrated utility in rapid screening for COVID-19–related Cochrane reviews, highlighting its relevance in accelerating evidence synthesis during public health emergencies.[7]

Benefits for Medical Students & Conclusions

Many Cochrane Crowd volunteers are students in health-related fields, which may reflect their familiarity with medical literature and interest in research.[3] Based on my experience, medical students are well positioned to contribute due to their foundational understanding of clinical research and motivation to explore emerging topics.

Participants can obtain certificates for completed tasks and accumulate points toward Cochrane membership. Screening more than 1,000 records confers membership benefits, including access to learning materials and discounted use of RevMan.[8]

Contributing to evidence synthesis while developing research skills is valuable. Even brief, consistent participation can support the advancement of evidence-based medicine. Experiences may vary depending on time commitment and prior exposure to research.

In conclusion, participation in platforms such as Cochrane Crowd and Engage provides a structured and accessible pathway for students to engage in evidence synthesis and contribute to a global effort to improve patient care.

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Letter

Letter to the Editor Regarding "Burnout in Ophthalmology Residents in a Tertiary Referral Hospital in Mexico City"

Ashley Lim.[1]

To the Editor

I read with great interest the original article on burnout in ophthalmology residents by Medina-Gaona and colleagues published in the October-December 2025 issue of the International Journal of Medical Students.[1] The study effectively highlights the high prevalence of burnout among trainees at a tertiary hospital in Mexico City, emphasizing its links to chronic stress, emotional exhaustion, depersonalization, and reduced personal accomplishment. However, there are additional aspects of resident well-being and systemic factors that warrant further exploration to address this pervasive issue in medical training.

The authors identify key contributors like sleep deprivation, unhealthy diets, and heavy workloads, with burnout associated with self-reported medical errors. The article could further delve into the role of institutional policies, such as mandatory rest periods or mentorship programs, which have mitigated similar issues in other contexts.[2] Emerging evidence suggests that structured wellness interventions, including mindfulness training, can reduce burnout dimensions like emotional exhaustion.[3] A deeper discussion of these strategies would equip residency programs with actionable tools to prevent escalation into mental health crises, given that 10% of participants reported suicidal ideation.

The comparison to international data is insightful, noting higher rates in Mexico due to socioeconomic challenges. Yet, the section on global benchmarks could expand on cultural variances; for instance, studies in Saudi Arabia report 41% prevalence, potentially influenced by differing healthcare infrastructures.[4] Addressing limitations like the 45% response rate and potential self-selection bias would strengthen the findings.[5] Longitudinal follow-up could reveal how burnout evolves across residency years.

In summary, the authors have adeptly compiled crucial data on burnout in ophthalmology residents, offering valuable insights for improving trainee support and patient safety. Their rigorous analysis provides a foundation for targeted reforms. I commend their contribution and anticipate further research on implementing preventive measures in resource-constrained settings.

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Erratum

Erratum to: Thomas E, Shenod S, Madhu B, SR S, S R. Empathy in Practice: Comparing Physicians' Self-Assessment and Patient Perceptions Using the Jefferson Scales. *International Journal of Medical Students.* 2025;13(4):384–389

Editorial Office, *International Journal of Medical Students*.

The Erratum

In the article titled *"Empathy in Practice: Comparing Physicians' Self-Assessment and Patient Perceptions Using the Jefferson Scales"* (Thomas E, Shenod S, Madhu B, SR S, S R. *Int J Med Students*. 2025;13(4):384–389. DOI: https://doi.org/10.5195/ijms.2025.3247), the authors identified an omission related to copyright permissions for the use of the Jefferson Scale of Empathy (JSE) and the Jefferson Scale of Patient Perceptions of Physician Empathy (JSPPPE).

The following statement clarifies this issue:

> "We failed to secure permission from the copyright holder before using the JSE and JSPPPE in our project. After contacting the copyright holder, scoring methods and use of the scale were verified and used without modification. Retrospective permission has been received from Thomas Jefferson University."

This correction has been issued to ensure transparency and compliance with copyright requirements. The scientific content, results, and conclusions of the article remain unchanged.

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