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International Journal of Medical Students
The International Journal of Medical Students (IJMS) is a peer-reviewed open-access journal (ISSN 2076-6327) created to share the scientific production and experiences of medical students and recently graduated physicians worldwide.

International Journal of Medical Students
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Executive Committee

IJMS INTERNATIONAL JOURNAL *of* MEDICAL STUDENTS

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Editorial Office:
1400 Locust Street
Suite 3103
Pittsburgh, PA 15219.
United States of America (USA)
Tel.: 413-232-7884
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IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Editorial

Artificial Intelligence in Healthcare: Medical Students' Perspectives on Balancing Innovation, Ethics, and Patient-Centered Care

Eleanor Roy,[1] Sara Malafa,[2] Lina M. Adwer,[3] Houda Tabache,[4] Tanishqa Sheth,[5] Vasudha Mishra,[6] Moaz Elsayed Abouelmagd.[7] Andrea Cuscheri,[8] Sajjad Ahmed Khan,[9] Mihnea-Alexandru Găman,[10] Juan C. Puyana,[11] Francisco Javier Bonilla-Escobar.[12]

Introduction

Artificial intelligence (AI) is no longer a futuristic concept in medicine - it is increasingly shaping clinical practice, decision-making, and healthcare administration.[1] From AI-powered diagnostic tools to chatbots assisting medical students in their studies, these technologies offer enhanced efficiency in patient care, greater precision in diagnostics, and reduced workload for healthcare professionals. However, their rapid integration also introduces complex ethical dilemmas that challenge fundamental principles of medical ethics, including autonomy, justice, beneficence, and non-maleficence.[2]

A central issue in this debate is how to ensure that AI enhances rather than undermines ethical medical practice. Issues of ethical concern, such as preserving patient autonomy, balancing AI and human judgment in decision-making, ensuring transparency, addressing algorithmic bias and fairness, and safeguarding data privacy and ownership, form a large part of modern ethical discourse.[3] Recognizing the significance of these issues, various organizations, including the World Health Organization (WHO), are actively developing guidelines for best practices in AI-driven clinical applications. In particular, the WHO has identified six core principles for AI in healthcare: (1) Protect autonomy; (2) Promote human well-being, safety, and the public interest; (3) Ensure transparency, explainability, and intelligibility; (4) Promote responsibility and accountability; (5) Ensure inclusiveness and equity; and (6) Ensure AI remains adaptable and sustainable.[4]

As AI becomes deeply ingrained in healthcare, medical students, educators, and regulators must proactively address its ethical challenges. Future physicians require structured AI ethics education, institutions must establish governance frameworks and ethics committees for responsible AI deployment and regulatory bodies must implement policies that protect patient rights, ensure transparency, and uphold ethical standards in medical practice.[5] Given AI's transformative potential, it is essential to address its rapid evolution with a structured and forward-thinking approach rather than relying on reactive regulatory measures that struggle to keep pace with AI advancements or allowing AI models to self-regulate.

This editorial examines the ethical dilemmas surrounding AI in healthcare, emphasizing the importance of AI literacy in medical education, regulatory oversight, and ethical governance. As AI continues to shape medical practice, it is crucial for healthcare professionals, educators, and policymakers to implement safeguards that ensure fairness, transparency, and accountability. AI must remain a tool that supports, rather than dictates, clinical decision-making. Its integration into healthcare should be guided by rigorous oversight, continuous ethical evaluation, and a commitment to patient-centered care.

Patient Autonomy and AI Decision-Making

The increasing use of artificial intelligence in clinical settings is reshaping longstanding understandings of patient autonomy. At the heart of ethical medical practice lies the patient's right to make informed decisions about their care. While AI systems have introduced new opportunities for personalizing medicine, they also raise difficult questions about transparency, consent, and the patient's role in decision-making.

AI tools are now capable of analyzing complex clinical datasets, including electronic health records, laboratory results, and

1 MD Student, The University of Nicosia, Cyprus.
2 MD Student, Sant'Anna School of Advanced Studies, Italy.
3 MD Student, University of Nebraska Medical Center College of Medicine, USA.
4 MD Student, University Mohammed VI Polytechnic, Morocco.
5 MD Student, KJ Somaiya Medical College and Research Centre, India.
6 MBBS, MD Resident, All India Institute of Medical Sciences, Bhubaneswar, India.
7 MD Student, Kasr-Alainy Faculty of Medicine, Cairo University, Egypt
8 MD Student, Humanitas University, Italy.
9 MBBS, Birat Medical College Teaching Hospital, Morang, Nepal. Deputy Editor, IJMS.
10 MD, PhD(c) Faculty of Medicine, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania & Department of Hematology, Centre of Hematology and Bone Marrow Transplantation, Bucharest, Romania. Scientific Editor, IJMS.
11 MD, FACS, School of Medicine, Department of Surgery, Professor of Surgery, Critical Care Medicine, and Clinical Translational Science, Director for Global Health-Surgery, University of Pittsburgh, PA, USA. O'Brien Professor of Global Surgery for Royal College of Surgeons in Ireland (RCSI). Editorial Board Member, IJMS
12 MD, MSc, PhD, Department of Ophtalmology; University of Washington, Seattle, WA, USA. Fundación Somos Ciencia al Servicio de la Comunidad, Fundación SCISCO/Science to Serve the Community Foundation, SCISCO Foundation, Cali Colombia. Grupo de investigación en Visión y Salud Ocular, VISOC, Universidad del Valle, Cali, Colombia. Editor in Chief, IJMS.

Correspondence:
Francisco J. Bonilla-Escobar, editor.in.chief@ijms.info

imaging, to provide tailored recommendations that might otherwise take hours for clinicians to compile. In theory, this enhances autonomy by equipping patients with more information about their condition and options. Evidence suggests that when patients are presented with AI-supported information, they are more likely to participate actively in care planning, which can lead to improved clinical outcomes.[6]

Yet the reality is more nuanced. Many AI systems, particularly those using deep learning techniques, are poorly understood by clinicians themselves, let alone patients. These so-called "black box" models generate outputs through processes that are not easily interpretable, which means that even when a recommendation is accurate, the reasoning behind it may be unclear. This lack of transparency undermines the shared understanding that is essential to informed decision-making.[6] In one study, patients described feeling excluded when clinicians could not explain how AI-derived conclusions were reached, weakening trust in both the care and the clinicians providing it.[6]

This challenge is compounded by a lack of clear standards around disclosure. Patients are not routinely informed when AI tools are used to support decisions about their diagnosis or treatment. Although ethical and legal frameworks emphasize the importance of informed consent, few address the role AI plays in shaping clinical judgments.[6] Without explicit acknowledgment of AI's involvement, patients may remain unaware of its influence on their care.

From the clinician's perspective, AI is often seen as a valuable support system helping prioritize cases, reduce cognitive load, and improve diagnostic precision. For example, Clare, an AI triage tool implemented at OSF Healthcare, was shown to enhance the efficiency of patient prioritization.[7] However, its effectiveness depended on the critical engagement of physicians who interpreted its outputs within the clinical context. Where AI is followed unquestioningly, it risks supplanting rather than supporting medical expertise.

There is also growing evidence that patients are not always aware when AI systems are involved. A case study found that many patients were unaware that their diagnostic journey had been shaped in part by algorithmic input, raising concerns about transparency and patient satisfaction.[8]

Meeting these challenges requires changes in how physicians are trained. Beyond understanding how AI tools work, clinicians must be able to communicate their use to patients in language that is both clear and respectful. Medical education must incorporate not only technical instruction but also ethical training, particularly around consent and patient-centered communication.[9]

While AI has the potential to support autonomy by delivering more personalized care, its success depends on ensuring that patients are fully informed, and clinicians remain actively engaged. Upholding autonomy in the AI era requires more than access to technology - it demands clarity, communication, and a commitment to preserving the patient's voice at the center of clinical care.

Algorithmic Bias and Fairness in AI

The promise of artificial intelligence in healthcare is often framed around its ability to enhance efficiency, accuracy, and consistency. However, these benefits are not universally distributed. AI systems, like any tool shaped by human input, are vulnerable to bias - particularly when the data used to train them fails to reflect the diversity of the populations they are intended to serve.

Algorithmic bias in healthcare can lead to significant disparities in diagnosis, treatment, and outcomes. This often stems from unrepresentative or incomplete datasets. For example, AI models used in dermatology have been shown to perform poorly when assessing images of darker skin tones, a consequence of training datasets dominated by light-skinned individuals.[10]

One of the most cited examples of algorithmic bias comes from a study by Obermeyer et al., which revealed that a widely used risk prediction tool consistently underestimated the healthcare needs of Black patients. The algorithm used past healthcare costs as a proxy for health status, inadvertently reinforcing structural inequities that result in lower spending on Black patients. As a result, individuals with significant medical needs were systematically deprioritized.[3]

Bias can be introduced at any stage of AI development - during data collection, algorithm design, or deployment. Its effects are often difficult to detect without proactive auditing. Nonetheless, unchecked bias can entrench existing disparities and violate fundamental ethical principles of justice and equity. Public health experts have warned that without targeted interventions, AI may exacerbate the very inequities it is often touted to reduce.[11]

Addressing algorithmic bias requires a deliberate, system-wide approach. First, training datasets must be diversified to accurately reflect variations in ethnicity, gender, socioeconomic status, and geography. Second, algorithms must be designed with fairness metrics in mind, incorporating checks at every phase of development. Regular audits and impact assessments are essential to monitor performance across different demographic groups.[12]

Transparency is also crucial. Encouraging open science practices - such as the publication of model architecture, training data sources, and validation strategies - allows independent reviewers to evaluate the fairness and reliability of AI tools.[13,14] This openness fosters accountability and helps restore public trust in healthcare systems increasingly reliant on algorithmic decision-making.

Medical professionals have a key role to play. Physicians must be

trained to recognize the potential for bias in AI outputs and understand how these tools may perform differently across patient populations. Cultural competence, critical appraisal skills, and an awareness of social determinants of health should be embedded within medical education to ensure equitable use of AI in clinical practice.[15]

Ultimately, the ethical integration of AI depends not only on its technical performance but also on its alignment with the principles of fairness and justice. To serve all patients equitably, AI systems must be designed and deployed with an awareness of the systemic inequities they risk perpetuating. Ensuring that these technologies work for everyone - not just those best represented in the data - must remain a central concern in their development and use.

Table 1 presents key examples of how algorithmic bias has impacted clinical care, highlighting the real-world consequences of deploying AI systems without adequate safeguards. These cases reflect the urgent need for deliberate, equity-focused design and oversight in healthcare AI.

Data Privacy and Ownership

The rise of artificial intelligence in healthcare has brought longstanding questions of data privacy and ownership into sharper focus. As AI models depend heavily on vast quantities of patient data to function effectively, concerns have emerged over how this data is sourced, who controls it, and whether patients retain any meaningful agency over its use.

Historically, debates over data ownership in medicine have been limited to academic and legal circles. However, the involvement of non-medical entities, particularly private technology companies, have complicated this landscape. In an increasingly competitive market, the pressure to develop more advanced and cost-effective AI tools often comes at the expense of ethical considerations around consent, privacy, and transparency.[16,17]

A widely discussed example is the use of online medical images, such as mammograms, for training AI models. While this may seem efficient, questions quickly arise: Were these images obtained with patient consent? Did the institutions that uploaded them have the right to do so? Should hospitals or companies be considered the owners of clinical data, or do those rights ultimately belong to the patients themselves?

These questions echo historical injustices, most notably the case of Henrietta Lacks. In 1951, cancerous cells were taken from her without her knowledge or consent and later became the basis of the *HeLa* cell line - one of the most important tools in biomedical research. It took decades for her family to even learn of the cells' existence, let alone be included in decisions about their use or benefit from their commercial applications.[18-23] The legacy of her case serves as a powerful reminder that scientific progress must never come at the expense of individual rights.

As medicine becomes increasingly entangled with non-medical entities, traditional ideas of consent must evolve, or risk becoming outdated. If accepted standards are applied uncritically, ethical breaches may occur. ***Table 2*** highlights how these risks may unfold in practice.

The use of patient data to train AI models today carries similar ethical risks. For instance, if publicly available scans are used without clear consent or de-identification, there may be breaches of both privacy and trust. Additionally, when such data is collected across jurisdictions, the question of which privacy laws apply becomes increasingly complex. The 2016 collaboration between DeepMind and the Royal Free NHS Foundation Trust exemplifies these concerns, as it was criticized for transferring patient data without adequate transparency or safeguards.[25]

Table 1. Illustrative Cases of Algorithmic Bias and Their Consequences in Healthcare AI.

Example	Description	Impact
Obermeyer et al. (2019) Study	AI underestimated Black patients' health needs based on cost predictions.	Potential denial of care, widening disparities.
Skin Cancer Detection	Less accurate for darker-skinned patients due to light-skinned training data.	Missed diagnoses, harming minority health.
VBAC Algorithm (2007)	Biased against non-White women by assuming White symptom patterns.	Unequal risk assessments, limiting care access.

Table 2. Scenario and Impact Analysis of Lack of Patient Autonomy in the Development of AI Systems.

Scenario	Impact
Use of scans without prior authorization from academic sources	Potential violation of intellectual property rights
Lack of patient consent for data use	Erosion of patient agency and informed choice
Use of publicly available scans without context (e.g. nationality, case history)	1. Risk of misdiagnosis or bias due to missing clinical context 2. Unregulated cross-border data transfers, including to politically sensitive jurisdictions[24]
Diagnostic outputs generated by non-medical entities (e.g. tech companies)	Circumvention of data privacy laws that apply to regulated healthcare providers

Compounding the issue is the regulatory gap between medical and non-medical actors. While frameworks like the Health Insurance Portability and Accountability Act (HIPAA) and the General Data Protection Regulation (GDPR) govern health data within clinical settings, tech companies developing AI tools often operate outside these constraints.[26-29] To address these gaps, some have proposed rethinking data ownership models. Rather than viewing data as the property of institutions, dynamic consent frameworks could position patients as active stakeholders, with rights to grant or withhold permission, define terms of use, and even share in downstream benefits.[30-32] Hospitals, as data custodians, may serve as intermediaries in this model, facilitating transparent agreements between patients and data users.

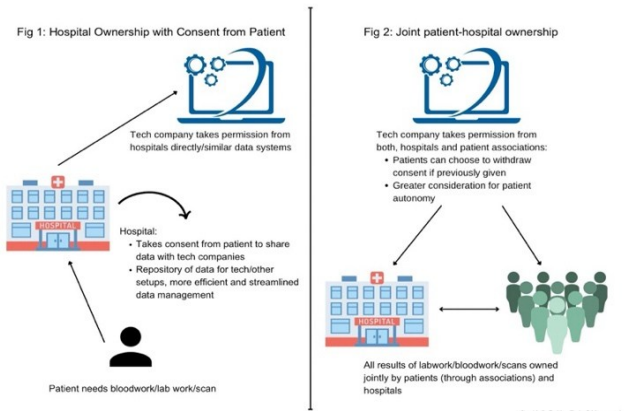
Figure 1 illustrates how responsibilities for data ownership may shift between patients, healthcare providers, institutions, and commercial developers, depending on the regulatory environment and consent model in place. This visual offers a framework for understanding the complexity of stakeholder roles in data governance and the necessity of rethinking ownership in an AI-driven healthcare system. There remains scope for improvement, as is the case with any evolving concept, but recognizing ownership and consent as dynamic is a critical first step. These principles must be actively re-evaluated and embedded in the rapidly transforming landscape of digital medicine.[33-35]

The ethical foundations of autonomy, fairness, and privacy are tightly interconnected. A lack of transparency in AI systems undermines patient autonomy and obscures bias, as opaque algorithms hinder interpretability and trust. Strong data privacy protections are essential to maintaining public confidence. Without them, patients may be less willing to share information, thereby limiting the effectiveness of AI and reinforcing health disparities.

Meeting these challenges requires collaboration among stakeholders. Medical education should incorporate AI ethics, explainability, and patient-centered communication to prepare clinicians for technology-driven healthcare environments.[9] Recent developments, such as the World Health Organization's designation of the Digital Ethics Centre at Delft University of Technology as a Collaborating Centre on AI for Health Governance in 2025, highlight growing global momentum. The WHO's six core principles - protecting autonomy, promoting safety and well-being, ensuring transparency, fostering accountability, supporting equity, and enabling sustainability - offer a robust foundation for ethical oversight.[4]

AI offers tremendous potential to transform healthcare by reducing inefficiencies, enhancing research, and improving access to specialized care, particularly in underserved regions. However, this progress must be aligned with ethical safeguards that preserve the integrity of clinical practice and uphold patient dignity. Redefining data ownership and reinforcing patient autonomy can support a shift from passive data extraction to participatory governance, positioning patients as collaborators in their care, not mere data points.

Figure 1. Conceptual Models of Data Ownership Distribution Among Healthcare Stakeholders.



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As legal systems work to catch up with technological change, patient awareness will remain a cornerstone of ethical implementation.[36] Grassroots advocacy can help increase understanding of data rights, identify and address bias, and push for stronger regulatory protections. Empowering patients with the technical literacy needed to understand and assert their rights will foster greater confidence and control over how their data is used.[37,38]

As AI reshapes healthcare, ethical integration is essential to ensuring that innovation serves patients rather than displacing them. By promoting transparency, securing consent, addressing bias, and safeguarding privacy, stakeholders can build a healthcare system grounded in equity, accountability, and trust.

AI Ethics in Medical Education: Preparing Future Physicians

As artificial intelligence becomes more integrated into clinical practice, its presence in medical education has become unavoidable. AI tools, including chatbots and large language models, are now widely used by students for study assistance, summarizing content, and engaging in interactive learning environments. Many report these tools as helpful for saving time and reducing anxiety during learning, particularly when managing routine tasks.[39, 40]

The use of ChatGPT among medical students has expanded significantly. By 2023, studies showed usage rates between 30–50% in high-income and international institutions, and over 75% in low- and middle-income countries.[41,42] These trends reflect growing accessibility and reliance on AI platforms in academic settings. While earlier versions of ChatGPT achieved modest accuracy on licensing exams (58% with GPT-3.5), more recent iterations, such as GPT-4, have demonstrated notable improvements, reaching 81% accuracy and passing most assessments.[43,44]

Despite these gains, ethical and academic concerns persist. A 2024 cross-sectional study of 614 medical students in Egypt found that while 78.5% had used ChatGPT and 64% found it helpful, 71.3% expressed concern about its potential misuse,

particularly regarding academic integrity, privacy, and the risk of policy violations.[42]

Medical education has always been about more than memorization or exam performance. Its foundation lies in nurturing critical thinking, ethical reasoning, and compassionate care. As AI becomes more prevalent in clinical settings, medical training must evolve accordingly. Future physicians must not only understand how to use AI but also how to question it, interpret it responsibly, and recognize its limitations.

The urgency of this transformation is reflected in recent scholarship and practice. Research suggests that physicians who integrate AI tools effectively can improve clinical outcomes.[45,46] However, meaningful integration requires more than technical skills. It demands ethical judgment and contextual awareness - particularly in settings where resource limitations or population-specific factors may challenge AI applicability. Studies from sub-Saharan Africa and Southeast Asia have demonstrated that algorithms trained on data from high-income countries often perform poorly when deployed in different clinical environments.[47,48]

To prepare students for these realities, medical education must focus on critical competencies, including:

- **Evaluating AI critically**: Students should learn when AI enhances care and when it should be challenged.
- **Balancing human and algorithmic judgment**: Clinicians must know when statistical outputs fail to capture a patient's lived experience.
- **Addressing health disparities**: Curricula must emphasize how AI can unintentionally reinforce systemic inequities.
- **Communicating transparently with patients**: Future physicians need to explain the role of AI in patient care clearly and ethically.

Yet, formal training on these issues remains rare. Evidence shows that patients interpret algorithmic health recommendations differently than those provided by physicians, creating a new layer of complexity in patient communication.[49, 50] Bridging this gap will require structured curricular reforms.

Based on current literature and educational theory, five key reforms are recommended:

1. **Case-based learning using real-world AI examples**: Embedding cases that reveal algorithmic limitations, particularly in under-resourced settings, promotes contextualized learning.[51]
2. **Interdisciplinary collaboration**: Involving ethicists, data scientists, and clinicians fosters a more complete understanding of AI's impact. [52]
3. **Structured communication training**: Teaching students to discuss AI outputs with patients in clear, honest terms helps avoid overreliance or misplaced trust.
4. **Bias recognition and mitigation**: Training on how datasets reflect and reinforce social inequities is essential for ethical AI use. [11, 53]
5. **Simulation of clinical decision-making with AI support**: Encouraging students to weigh AI recommendations against clinical judgment reinforces the principle that AI should support, not replace, human decision-making.

Ultimately, the goal is not simply to teach AI proficiency but to cultivate what scholars have called "contextual wisdom" - the ability to adapt AI use to different patient needs, settings, and ethical considerations.[54] Medical schools that succeed in this will graduate physicians who can harness the benefits of AI while remaining grounded in the values that define responsible and humane medical practice: beneficence, non-maleficence, justice, and respect for patient autonomy.

Future Directions: AI Governance & Ethical Guidelines

As artificial intelligence continues to reshape healthcare, from diagnostics and triage to administrative operations, establishing robust ethical and regulatory frameworks has become essential. Without these safeguards, AI implementation risks perpetuating biased decision-making, compromising data security, and undermining trust in medical systems.[55,56]

Recent research has emphasized both the transformative potential of AI in improving clinical workflows and the ethical vulnerabilities that arise when regulation fails to keep pace with innovation. Key challenges include algorithmic bias, cybersecurity risks, and fragmented oversight, all of which threaten the safe, equitable, and responsible adoption of AI in healthcare settings.[57, 58, 59] Addressing these concerns is not just a compliance issue but an ethical imperative. AI must enhance, not replace, clinical judgment, and it must do so in ways that are transparent, accountable, and fair.[60,61]

A comprehensive governance strategy is necessary to guide the development and deployment of AI tools. Policymakers must enact clear and enforceable regulations that define liability, mandate transparency, and incorporate mechanisms for monitoring algorithmic fairness.[62] Beyond the legal realm, educational institutions and professional boards also have a role to play. By embedding AI ethics and digital literacy into medical training, future physicians can be equipped to assess algorithmic outputs critically and advocate for their patients in increasingly complex clinical environments.[63-65]

In addition to preventive regulation, real-time oversight mechanisms are needed. The establishment of independent auditing bodies focused specifically on AI in medicine would allow for continuous evaluation of safety, equity, and efficacy as technologies evolve.[66-68] These efforts must go beyond technical performance assessments to include social, cultural, and ethical

dimensions—recognizing that the consequences of AI in healthcare extend far beyond clinical outcomes alone.

While AI has immense potential to improve healthcare delivery and outcomes, its long-term success depends on embedding ethical considerations into every stage of its lifecycle. Developing trustworthy AI systems requires ongoing collaboration among technologists, clinicians, patients, ethicists, and regulators. By ensuring that these systems are transparent, equitable, and accountable, healthcare can benefit from innovation without compromising its fundamental ethical commitments.

Conclusion

Artificial intelligence is no longer a theoretical possibility in medicine- it is an active and expanding force within clinical care, research, and education. While its potential to enhance diagnostics, streamline processes, and extend access is well recognized, its integration raises equally significant ethical considerations that demand critical attention.

This editorial has examined how AI challenges established principles of autonomy, fairness, and privacy. From the risk of opaque decision-making and algorithmic bias to questions surrounding consent and data ownership, AI has exposed ethical blind spots across multiple domains of healthcare. These are not isolated concerns; they reflect deeper systemic gaps that require coordinated responses.

Preparing future clinicians to navigate these challenges will require more than technical fluency. Medical education must be restructured to equip students with the tools to interpret, question, and ethically apply AI within diverse clinical contexts. Ethical reasoning, communication skills, and an understanding of social determinants of health must be integrated alongside digital literacy.

At the same time, governance must evolve. Regulatory frameworks must be clear, enforceable, and responsive to the rapidly changing technological landscape. Policies should ensure accountability, uphold transparency, and protect patients from harm, regardless of the complexity of the tools in use.

Crucially, patients must remain at the center of this transformation. Empowering individuals with control over their data and ensuring meaningful participation in the development and implementation of AI tools are essential steps in maintaining trust and dignity in care.

The future of AI in healthcare will be defined not only by its capabilities, but by the ethical choices that shape its use. By embedding fairness, accountability, and respect for persons at every level, from policy to practice, we can ensure that AI strengthens, rather than compromises, the foundations of medical ethics.

In This Issue

This issue features a diverse collection of original research, reviews, and experience-based articles that reflect key challenges and innovations in global health and medical education. Original studies explore a range of topics, including medication adherence in patients with chronic diseases in India,[69] the impostor phenomenon among Sudanese medical students,[70] biases in interprofessional healthcare education,[71] and the under-recognition of sports and exercise medicine.[72] Clinical research includes a case series on pediatric hepatoblastoma[73] and a national database analysis of psychiatric outcomes in patients with trigeminal neuralgia.[74] Mental health and educational innovation are further highlighted through a pilot curriculum developed for minority youth.[75] A critical review addresses academic burnout among Mexican medical students,[76] while a case report illustrates the complex management of a hydatid cyst with biliary complications.[77] The experience articles provide powerful insights from frontline work, including public health training initiatives in the UK[78] and Pakistan,[79] reflections on surgical life,[80] and educational tools for geriatric care.[81] Together, these contributions shed light on the evolving landscape of medical practice and training across different regions and discipline

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Original Article

Am I A Fraud? Occurrence and Factors Associated with Impostor Phenomenon Among Medical Students of Khartoum University, 2022

Hiba K. A. Hamad.[1]

Abstract

Background: The impostor phenomenon (IP) is the tendency to attribute success to external factors rather than to one's abilities. It is frequent among students and has a negative impact on their wellbeing. This study aimed to assess the occurrence and mental health factors associated with IP in medical students. **Methods:** Cross-sectional study of University of Khartoum Medical students (December 2021–January 2022), using convenience sampling. We collected the Clance Impostor Phenomenon Scale (CIPS), Patient Health Questionnaire-4 (PHQ-4: anxiety and depression), 2-item Maslach B burnout Inventory (MBI), and Single-Item Self-Esteem Scale (SISE). Data was analyzed using SPSS with correlation analyses, linear regression, and Chi-square tests. **Results:** Among 409 medical students, the impostor phenomenon (IP) prevalence was 52.8% (216 students), with a mean CIPS score of 63.37 ± 17.02. IP was more common in females (71.8%) and students aged 19–21 years (40.7%). Anxiety (41.6%), depression (48.7%), and burnout (39.6% emotional exhaustion; 26.9% depersonalization) were prevalent, with higher rates in females. Regression analysis showed significant predictors of IP, including burnout (+1.32 points per unit, $p < 0.001$), perfectionism (+0.86 points per unit, $p < 0.001$), parental overprotection (+2.43 points per unit, $p < 0.001$), and depression (+2.90 points, $p = 0.024$), while self-esteem showed a negative association (−4.19 points per unit, $p < 0.001$). Gender differences were observed in three CIPS items, with stronger female endorsements. **Conclusions:** IP is prevalent and linked to family dynamics, personality traits, and mental health issues. Efforts to increase awareness and facilitate IP management should be implemented.

Introduction

Clance and Imes first used the term "impostor phenomenon" (IP) in 1978 to describe an internal feeling of intellectual phoniness that appears to be more common and severe in many accomplished women.[1] Pauline Rose Clance, a pioneer in the impostor phenomenon research field, defined the impostor phenomenon in 1985 as "an internal experience of intellectual phoniness that those who feel fraudulence and worthlessness in spite of outstanding academic or professional accomplishment have." [2] The women in Clance's study credited their achievements to outside influences like luck, misgrading, or the faulty judgment of professors.[1]

The impostor phenomenon, impostorism, or imposter syndrome, has received increasing attention in the last two decades. Subsequent research described the presence of IP in the male population, in many professional settings, and among multiple ethnic and racial groups.[3]

IP prevalence ranged greatly from 9% to 82%, mostly depending on the screening method and cutoff points employed to evaluate impostor phenomenon symptoms.[3] Many of these studies were conducted in the USA. A recent study in Saudi Arabia found a prevalence of 57.8% in a sample of 384 young adults.[4] Another study in the medical students of Imo State University, Owerri, Nigeria, found that 54.5% of the medical students had a CIPS score of 40 or below, indicating a few characteristic features of IP.[5] Medical students are among those afflicted with IP. This can be attributed to the highly competitive and demanding nature of admission to medical schools and the competitive nature of medical schools themselves. This course of study could promote the emergence of unhealthy thought patterns, such as impostorism, maladaptive perfectionism, and connecting self-worth with academic achievement.[6] According to a study by Rosenthal et al., 87% of new students had high or extremely high IP.[7]

Some studies have associated IP with personality traits like self-esteem (which was found to negatively correlate with IP)[5] and maladaptive perfectionism (which is considered a potential predisposing and sustaining factor of IP).[8] IP is also associated with psychiatric comorbidities such as depression, anxiety, and burnout.[3] It should be noted that the studies included are cross-sectional, and the direction of causality can't be deduced. The systematic review by Thomas and Bigatti pointed out that IP and perfectionism are among the most powerful predictors of psychological distress in medical students, with perfectionism also being a strong predictor of anxiety and depression.[9]

[1] MBBS. University of Khartoum, Khartoum, Sudan.

About the Author: *Hiba K. A. Hamad earned her Bachelor of medicine; Bachelor of surgery (MBBS) with first degree honors from University of Khartoum, Sudan (2023). This is her first published paper.*

Correspondence:
Hiba K. A. Hamad.
Address: Al-Qasr Avenue, Khartoum, Sudan.
Email: hibakamil2@gmail.com

Editor: Francisco J. Bonilla-Escobar
Student Editors: Lorraine Arabang Sebopelo, Ahmed Nahian, Lourdes Adriana Medina-Gaona
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Another factor involved with IP is family dynamics, such as maternal and paternal overprotection. which were linked with higher impostor scores.[10]

Medical students are at a high risk of developing Impostor Phenomenon (IP)[7], which has been identified as a predictor of psychological distress in this population.[9] A recent study by Katherine S. Hu et al. revealed that 31.9% of 169 medical students had "high" or "intense" IP scores. In comparison, only 3.5% and 12.2% of students had low to moderate scores, respectively. The study found that students with high/intense levels of IP were more likely to experience negative feelings of shame/embarrassment (22.2%) and inadequacy (29.6%), which were associated with higher levels of depression and anxiety.[11]

This study aims to increase awareness about IP and associated mental health factors among medical students worldwide. It also explores associated family dynamics and introduces a new regression model to help in identifying high risk medical students. This study is also a first of its kind in the Sudanese medical student's population and adds the growing body of literature in Sudan and the African region. Therefore, the aim of this study is to identify the occurrence and factors associated with impostor phenomenon among medical students at Khartoum University, Sudan, in 2021–2022.

Methods

Study Design: This cross-sectional analytical study was conducted at the University of Khartoum, Faculty of Medicine, in Sudan. It included all students enrolled in the faculty at the time, comprising seven batches and a total population of 2,334 students. The study was carried out from December 23, 2021, to January 17, 2022.

Sampling Method: A non-probability convenience sampling method was employed. The proposed sample size was calculated[12] based on a prevalence of 50%, a confidence level of 95%, a 5% margin of error, and a population size of 2,334 students. This resulted in a proposed sample of 330 participants, which was divided among the seven batches, with approximately 47 students selected from each batch. To account for potential non-responses, the sample size was increased by 20%, resulting in the collection of 409 responses.

Data Collection: Data was collected using a self-administered Google Form questionnaire, which was semi-structured, closed-ended, and pre-coded. The questionnaire consisted of three main sections. The first section captured the socio-demographic data of participants. The second section assessed the impostor phenomenon and its associated factors. The third section provided participants with links to articles and videos about the impostor phenomenon and its management to raise awareness about the condition.

Measurement Tools: We used the Clance impostor phenomenon scale (CIPS), a 20-item scale, self-reported measure, to assess IP. It has a range of 20 to 100 and was interpreted as follows: 40 or less = few impostor characteristics; 41 to 60=moderate IP characteristics; 61 to 80 = frequently have impostor characteristics; and higher than 80 =intense IP characteristics.[13] A cut point of 62 was used to differentiate between impostors and non-impostors.

We chose to measure self-esteem using the Single-Item Self-Esteem Scale (SISE), which has comparable predictive validity and strong convergent validity with the Rosenberg Self-Esteem Scale.[14] Participants answer the single item on a 5-point Likert scale.

Burnout was assessed using the two-item abbreviated Maslach B burnout Inventory (2-item MBI), which assesses two domains of burnout: emotional exhaustion (a state of emotional depletion at work) and depersonalization (a lack of feelings or negative and/or cynical feelings toward others). It's scored on a 0 to 6 Likert scale and a score of >3 for either item indicated burnout. It correlated with the Maslach B burnout Inventory (MBI), with a sensitivity and specificity of 93.6% and 73.0%, respectively.[15]

The 4-item Patient Health Questionnaire-4 (PHQ-4) contained the 2-item depression scale (PHQ-2) and the 2-item anxiety scale (GAD-2). It was used to assess depression and anxiety over the past two weeks. The score for each subscale ranged from 0 to 6, while the total score ranged from 0 to 12. For the PHQ-2 and the GAD-2, scores of ≥3 reflect depression or anxiety, respectively. The following categories correspond to the total PHQ-4 score: normal (0–2), mild (3-5), moderate (6–8), and severe (9–12).[16-17]

Frost Multidimensional Perfectionism Scale-Brief (FMPS-B) was used to assess perfectionism. It has eight questions, divided into two subscales: evaluative concerns and strivings. The items were scored on a Likert scale from 1 to 5, for a minimum total score of 8 and a maximum of 40. Higher scores indicated stronger perfectionistic tendencies.[18]

To minimize survey fatigue and maximize response rates, short yet validated scales, with the exception of the CIPS, were chosen for this study.

Data Analysis: The data was analyzed using SPSS version 26. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were calculated to summarize socio-demographic characteristics and comorbidities. Bivariate analyses were conducted to explore associations between variables. Comparisons of the CIPS mean score with socio-demographic factors were performed using the Student's t-test and one-way ANOVA, with a significance level of $p \leq 0.05$. Correlations between the CIPS total score and associated factors were assessed using Spearman's rho and Pearson's r coefficients.

A multiple linear regression model was developed to predict impostor phenomenon, with the CIPS mean score as the dependent variable. The independent variables were selected

using stepwise selection method. To avoid multicollinearity between the independent variables, multicollinearity diagnostics tools were used. Multiple models were produced and the best fit chosen based on the R-squared (0.550). An item analysis of the Clance Impostor Phenomenon Scale was also conducted to evaluate its internal structure. Gender differences in individual CIPS items were analyzed using the Chi-square test.

Ethical approval for the study was obtained from the Community Medicine Department at the University of Khartoum. Informed consent was obtained from the students at the beginning of the Google form survey, and no information that could lead to student identification was collected.

Results

The study included 409 students. Their socio-demographics are shown in ***Table 1.*** Using 62 as a cut point on the Clance impostor phenomenon scale (CIPS), the *occurrence* of the impostor phenomenon was found to be ***52.8% (216).*** The mean CIPS score was 63.37 (SD = 17.02), with a range of 20 to 100. IP category distribution is shown in ***Table 1.*** Of the 216 participants who had IP, 155 (71.8%) were females and 61 (28.2%) were males. Out of the 216 students with IP, 208 (96.3%) were single, 7 (3.2%) were married, and one (0.5%) was divorced. The age category between 19 and 21 had the highest occurrence of IP of 88 (40.7%), while the category between 25 and 30 had the lowest occurrence of IP with only 12 (5.6%) students.

Anxiety and depression were measured using a 4-item PHQ scale; the mean of the total sample was 5.4 ± 3.5, with a range of 0 to 12. The mean of the 2-item depression scale (PHQ-2) for the total sample was 2.8 ± 1.9, with a range of 0 to 6. The prevalence of depression among the students was 48.7% (n = 199), and 142 (71.4%) of those depressed were females. The 2-item anxiety scale (GAD-2) had a mean (SD) of 2.6 ± 1.9, with a range of 0 to 6. Females also had a higher anxiety prevalence in 126 (74.1%) students.

Burnout was assessed using a 2-item MBI scale; the total sample mean was 5.5 ± 3.5, the range (0–12). The burnout rate was higher in females: 124 (76.5%). For the emotional exhaustion item of the 2-item MBI scale, more than a third of the students had feelings of burnout from the study (39.6%, n = 162). The mean score for this item was 3.2 ± 1.9, with a range of 0 to 6. On the other item, depersonalization, about 26.9% of the students had feelings of depersonalization (n = 110) with a mean score of 2.3 ± 2, with a range of 0 to 6. Females also had a higher depersonalization rate of 71.8% (79 students). The prevalence of these comorbidities is shown in ***Table 1.***

The mean of the single-item self-esteem scale for the whole group of students was 2.3 ±1.1, with a range of 1 to 5. To the statement: I have high self-esteem, 14.4% of the students described it as not very true of me (n = 59), 19.1% responded as untrue of me (n = 78), 39.1% as neutral (n = 160), 18.3% as true of me (n = 75), and only 9% responded as very true of me (n = 37).

Upon assessing perfectionism, the mean of the 8-item FMPS-B scale for the total sample was 24.1 ± 6.4 (8 to 40 range). The Evaluative Concerns for the Perfectionism domain had a mean (SD) of 11.08 (3.97). The striving for perfectionism domain had a mean (SD) of 13.06 (4.01). Females had a higher mean of 24.64 (SD = 6.51), compared to males with a mean of 23.02 (SD = 6.06), n = 401 (with 8 students who didn't answer to this question).

The mean for parental overprotection turned out to be 3.26 (SD = 1.18), with a range of 1–5. The responses to the statement: my parents are overprotective were: 9.3% of the students responded strongly disagree (n = 38), 15.6% disagreed (n = 64), 31.1% were neutral (n = 127), 27.6% agreed (n = 113), and 16.4% strongly agreed (n = 67).

We assessed family dynamics using a multiple-choice question where 220 students (53.8% of the total sample) mentioned at least one of the family dynamics, while the other 189 students (46.2%) provided "none of the above" as a response to this question. The family dynamics and their statistics are shown in ***Figure 1.***

This study found a statistical association between IP and gender (p = 0.028) and academic year (p=0.008). The other socio-demographic factors had no statistical association.

Self-esteem, parental over-protection, anxiety, depression, burnout with its two items: emotional exhaustion and depersonalization, and perfectionism with its two subscales (strivings and evaluative concerns) all had a moderate to strong degree of correlation with the total CIPS score (all with p<0.001), as shown in ***Table 2***.

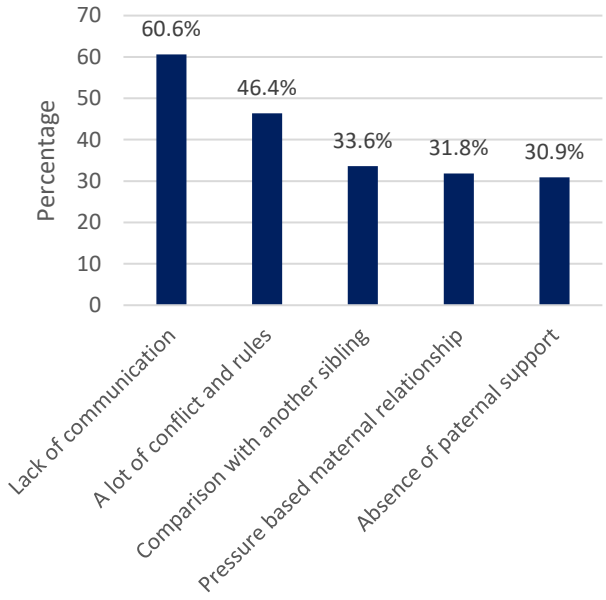
Table 3 shows the multiple linear regression model. The model indicates a significant relationship between the linear combination of the predictors and the IP score, $F(6,394)=80.3$, $R^2 = 0.550$, $p<0.001$. Burnout scale score is a significant predictor, with each unit increase in burnout associated with a 1.32-point increase in the IP score (p<0.001). Conversely, self-esteem shows a negative relationship with IP; for every unit increase in self-esteem, there is a 4.19-point decrease in the IP score (p<0.001). Perfectionism is also a significant positive predictor, with each unit increase in perfectionism associated with a 0.86-point increase in the IP score (p<0.001). Parental overprotection predicts a 2.43-point increase in the IP score for each unit increase in overprotection (p<0.001). Students reporting pressure-based maternal relationships have an IP score that is 3.49 points higher than their counterparts (p=0.028). Additionally, students identified as depressed have a 2.90-point higher IP score compared to those not identified as depressed (p=0.024).

When analyzing the correlation between the total CIPS score and the individual items of CIPS, we found that the scores on

individual CIPS items have a moderate to high degree of correlation with the total CIPS score (p<.001 for all items). The item analysis is attached in the ***Supplementary Materials***.

We then proceeded, Using the Chi-square test to compare males and females regarding individual CIPS items This revealed differences in the ratings of three items, 1, 14, and 18. Females endorsed all three items more strongly than males. There were no differences in the ratings of the remaining 17 items, as shown in ***Figure 2.***

Figure 1. Responses to Family Dynamics Statement (Students Could Provide Up to 5 Responses), n= 220.

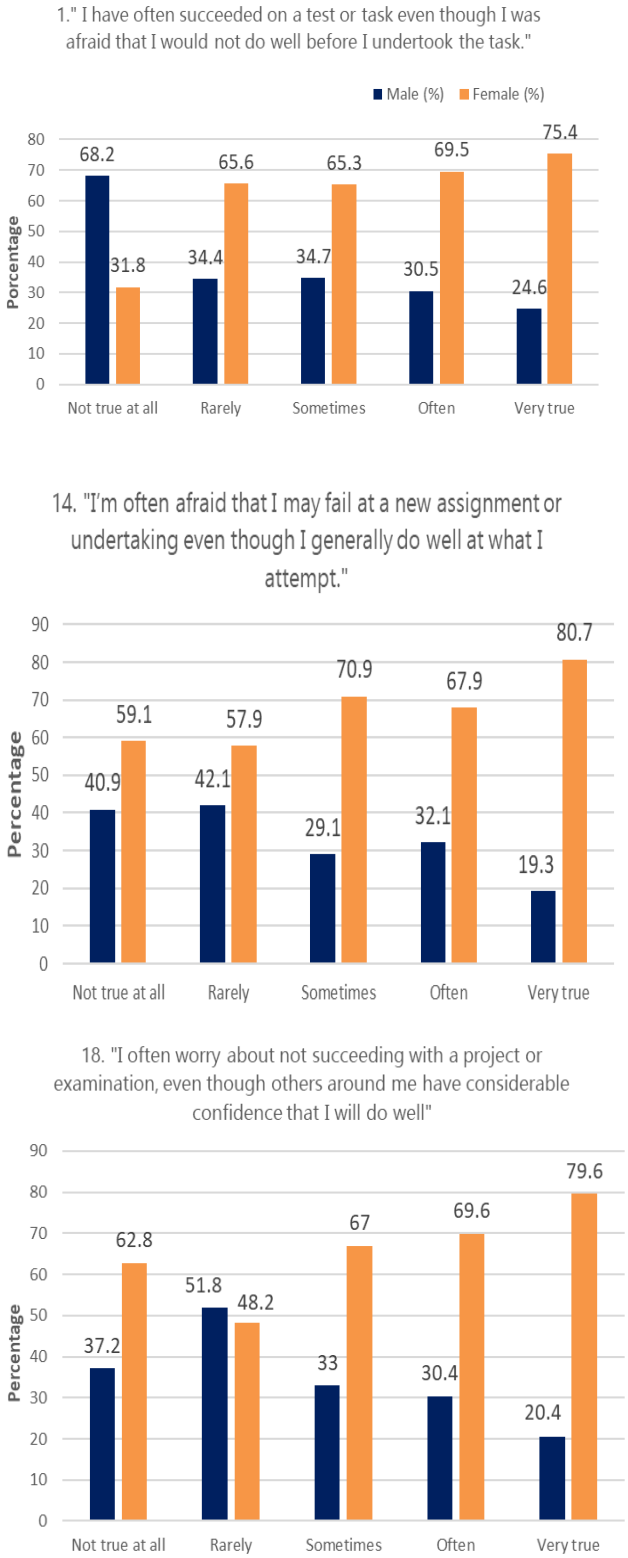


Discussion

This study investigated the occurrence and factors associated with the impostor phenomenon among medical students of Khartoum University. Most of the study participants were females, 278 (68%). This is similar to Alrayyes S et al. study[4] and contrasts with the study by J. N. Egwurugwu et al., where the majority were males.[5] The sample reflects the dominance of females in the study population of the University of Khartoum. The age range was between 17 and 30, which is in line with the study population of both Alrayyes S et al[4] and J. N. Egwurugwu et al.[5] Most of the participants were single, 397 (97.1%). Only 11 (2.7%) were married. Of these, ten were female. A low marriage rate of 12% was also reported by J. N. Egwurugwu et al.[5]

IP was found to be highly prevalent, with an occurrence of 52.8%. This is lower than Saudi Arabia's study prevalence (57.8%).[4] and is higher than the prevalence range reported by Thomas and Bigatti in their systemic review.[9] Our study participants exhibit high characteristics of IP. 223 (54.6%) of participants had CIPS score more than 61. This is in contrast to J. N. Egwurugwu et al., where participants showed lower characteristics of IP and higher levels of self-esteem.[5]

Figure 2. Distribution of Responses by Gender to CIPS Items 1, 14, and 18 Using the Chi-Square Test.



Legend: For item 1 (p=.002), females mean score was 3.9 ± 1, males mean score was 3.5± 1.3. For item 14 (p=.014), females mean score was 3.2 ± 1.4, males mean score was 2.8 ± 1.3. For item 18 (p=.002), females mean score was 3.6 ± 1.3, males mean score was 3.1 ± 1.3.

Table 1: Sociodemographic Factors and Impostor Phenomenon Comorbidities Among Students at the University of Khartoum Faculty of Medicine (n=409).

	Category	Frequency	%
Age group	18 and less	49	12
	19-21	164	40.3
	22-24	167	41.0
	25-30	27	6.6
Gender	female	278	68.0
	male	131	32.0
marital status	single	397	97.1
	married	11	2.7
	divorced	1	.2
Academic year	1st year (A)	56	13.7
	1st year (B)	57	13.9
	2nd year	59	14.4
	3rd year	56	13.7
	4th year	59	14.4
	5th year	62	15.2
	6th year	60	14.7
Impostor phenomenon (62 as cut point on CIPS)	Yes	216	52.8
	No	193	47.2
Impostor characteristics (CIPS scores)	Intense (>80)	71	17.4
	Frequent (61-80)	152	37.2
	Moderate (41-60)	145	35.5
	Few (40 or less)	41	10
Depression	Yes	199	48.7
	No	210	51.3
Anxiety	Yes	170	41.6
	No	239	58.4
Burnout (Emotional exhaustion)	Yes	162	39.6
	No	247	60.4
Burnout (depersonalization)	Yes	110	26.9
	No	299	73.1

Table 2: Correlations Between CIPS Scores and Self-Esteem, Anxiety, Depression, Burnout, Perfectionism, and Parental Overprotection (n=409).

Factor	*Total CIPS score*	
	r coefficient	*p-value*
Self-esteem*	-0.435 (M)	<.001
Anxiety*	0.356 (M)	<.001
Depression*	0.445 (M)	<.001
Total burnout*	0.499 (M)	<.001
burnout from the study*	0.492 (M)	<.001
Depersonalization*	0.380 (M)	<.001
parental over protection*	0.340 (M)	<.001
total perfectionism**	0.538 (S)	<.001
evaluative concerns**	0.641 (S)	<.001
striving for perfectionism**	0.226 (Sm)	<.001

Legend: *using Spearman Rho coefficient; **using Pearson r coefficient M=Moderate correlation, S= Strong correlation, Sm= Small correlation. All variables have moderate to strong correlations with the total CIPS score except for the striving for perfection domain which has a small degree of correlation (r=.226), (p<.001 for all variables).

Table 3: Predictors of Impostor Phenomenon Among University of Khartoum Faculty of Medicine Students Using Multiple Linear Regression.

variables	Coefficients	p-value	95% Confidence Interval of the coefficients	
			Lower Bound	Upper Bound
(Constant)	37.424	<.001	31.414	43.434
Burnout scale score	1.323	<.001	0.944	1.703
self-esteem	-4.193	<.001	-5.221	-3.165
perfectionism scale	.856	<.001	0.660	1.052
Parental overprotection	2.429	<.001	1.418	3.441
pressure-based maternal relationship	3.496	.028	0.381	6.611
Depressed or not	2.902	.024	0.386	5.418

Legend: The linear combination of the measures was significantly related to the IP score, F(6, 394)= 80.3, p<.001.

The study revealed that a majority of individuals experiencing IP were females, with a significant association between gender and impostor phenomenon (P value =0.023), a finding consistent with Alrayyes S et al. research. This finding supports the correlation between female gender and IP, but it does not make gender an independent predictor of IP. It is important to note that IP can also affect males, and all individuals of should feel encouraged to seek help. Age was not significantly associated with IP (P = 0.528). This lack of association may be due to the narrow age range of the participants in this study. Age effects should be addressed in a wider age range to see if IP characteristics dwindle or increase with time.

Regarding the academic year, the mean score for students in the middle years (66.2± 15.9) was significantly higher than the mean CIPS score for students in the first years (60.1± 17.6) (p =.008). Final-year students did not differ significantly from early and middle-year students. This suggests that impostor feelings are more frequent in the middle years of medical school. B. Levant et al. studied IP in third-year students as they transitioned from preclinical to clinical years, and these students had moderate to frequent impostor feelings.[19] In our study, first year medical students had low IP feeling as opposed to a study by Rosenthal et al., where 87% of new students had high or extremely high IP.[7] This can be attributed to the students feeling highly confident after passing their high school exams, while later development of IP in subsequent years may be due to having lower confidence in the setting of peer pressure and demanding environment of the medical school.

Burnout rates have increased in recent years among both medical students and doctors.[9] Our study explored two items of burnout: emotional exhaustion and depersonalization (39.6% & 26.9%, respectively), and both items had a positive moderate correlation with CIPS score. These findings suggest that IP may contribute to burnout development. This is congruent with Alrayyes S et al.'s study.[4]

In our study, a high rate of anxiety and depression was reported (41.6% &48.7% respectively). Both had a positive, moderate correlation with the CIPS score. Since this is a cross-sectional study, we cannot draw a conclusion about causality. It is unclear whether these mental health problems increase the risk of developing IP characteristics, or they are caused by IP.[4] Regardless, these mental health problems should not be ignored.

The total score of FMPS-B had a strong positive correlation with the CIPS score. The subscale evaluative concerns also had a strong positive correlation with the CIPS score, while the strivings subscale had a low positive correlation. These findings serve to show that perfectionism can be used to predict IP. Similar findings were reported by Klug et al. [8]

Self-esteem was the only factor with a negative correlation with IP. This is also reported in Nigerian medical students.[5] A study by K. Cokley et al. suggested a model where self-esteem mediates the link between perfectionism and IP.[20] This model and our study findings reflect a way to help prevent those with perfectionistic tendencies from developing IP by increasing their self-esteem.

Another factor addressed in this study was parental overprotection. This was found to have a positive, moderate correlation with the CIPS score. Li, Hughes, and Thu reported this link as well.[10] From the start, family dynamics were included in Clance's study, in which she and Imes coined the term.[1] In our study, while many students reported a lack of communication with their families, it was the pressure-based maternal relationship that had a link with IP. This finding was also endorsed by Li, Hughes, and Thu[10] and explored in T. jeledan;s qualitative study.[21] In Sudan, mothers are commonly known to pressure their children to pursue academics and use peer pressure as means to motivate them.

A regression model was generated to accommodate all the factors correlated with IP and the change in CIPS score with these factors. Pressure based maternal relationship predicted the highest increase in the CIPS score (3.49 units), and self-esteem predicted the highest decrease in CIPS score (-4.19 units). It's noted that while lack of communication was the predominant family dynamic reported by the students, it was the pressure based maternal relationship that had the highest predicting value. The other family dynamics didn't do well when testing the model. This model provides insight to identifying high risk students and also possible solutions to address IP, such as helping students boost their self-esteem and treating depression and burnout.

In this study, an item analysis was also done, and all individual CIPS items had a moderate to high degree of correlation with the total CIPS score. Item six: "I'm afraid people important to me may find out that I'm not as capable as they think I am." And item 13, "Sometimes I'm afraid others will discover how much knowledge or ability I really lack." Had the highest correlation with the CIPS score. item one, "unfounded fear of failure" had the lowest correlation with the CIPS score.

Gender differences among the different CIPS items were studied, and it was found that the ratings of items 1, 14, and 18 differed significantly. Women favored all three items more than men. Item one reflects the unfounded fear of failure; item 14 is about the fear of failing at new assignments; and item 18 shows unfounded worries about succeeding. These findings are different from those of Levant et al., in which items 17 and18 had a gender difference but were also more endorsed by females.[19] Item 17 is about comparing one's abilities to others. These items can be more endorsed by women because they feel they have more to prove than their male counterparts.

Regarding the limitations of this study, it should be noted that as this is a cross-sectional study, the direction of causality can't be deduced. The relationship between impostor phenomenon and the factors explored in this study is one of association and not causation. This is especially evident with mental health comorbidities. We cannot determine if IP causes these

comorbidities or if the comorbidities caused IP. It should also be noted, that the sampling method used was a convenient non-probability sampling, which may impact the generalizability of the study results to the population at large. This sampling method is known to cause selection bias as only the students who were available at the time could be included in the study. However, to strengthen the results, the sample size was increased from 330 to 409 participants.

The questionnaire was self-administered, which can lead to social desirability bias, especially where mental health problems are regarded. We endeavored to reassure the students about their confidentiality and the anonymity of the questionnaire was stated in the beginning of the questionnaire. It is important to note that the tools used in the questionnaire to assess depression and anxiety, burnout and depersonalization, perfectionism, and self-esteem were all short screening tools, designed to avoid survey fatigue and not intended to reflect actual diagnoses of these factors. Additionally, since this study was conducted using a Google Form, only participants with internet access at the time were included.

In conclusion, this study found that medical students at Khartoum University experience a high occurrence of IP, with gender, academic year, self-esteem, parental overprotection, anxiety, depression, burnout, and perfectionism- all being associated with IP. The regression model included self-esteem and pressure-based maternal relationship, parental overprotection, depression, the emotional exhaustion item of burnout, and the perfectionism scale.

Given the mental and psychological status of the students at the University of Khartoum, preventive measures are necessary. The regression model developed by this study can help identify high-risk individuals. Support groups can be started for students identified by the model, as IP can be very isolating. Mental health problems can be addressed in the university clinic. In addition to solving the associated comorbidities, efforts should be made to address the maladaptive ways of thinking associated with IP.

Further studies should be conducted using probability sampling to ensure the generalizability of the results. To explore causality, research designs other than cross sectional studies may be used. Wider age ranges should be explored in subsequent studies. Gender differences in IP can also be further studied. The effect of IP on medical students and how it impairs their development as doctors is an important avenue that should be explored in depth as it can affect future patient care.

Summary – Accelerating Translation

Main problem: Impostor phenomenon, imposterism, commonly known as imposter syndrome, is a term used widely in the past few years. It is receiving increasing attention lately, and many people can relate to imposter syndrome.

The term was coined back in 1985 by Clance and Imes in the first study that described the impostor phenomenon in a sample of highly achieving females, which was defined as "an internal experience of intellectual phoniness that those who feel fraudulence and worthlessness despite outstanding academic or professional accomplishment have."
Since then, many studies have explored IP in both genders and among different occupations. The last few years specifically have seen a rise in the papers on the topic, most of which were in the USA.
Among the population studied were medical students and doctors. IP was reported by many as a feeling or a state accompanying the medical career. starting from the admissions, through the medical school itself, and passing on to residency. The feeling of not being enough or the feeling of fraudulence described by many in the field despite the evidence of the competency of these individuals has been a source of anxiety, depression, and burnout.

Addressing the impostor phenomenon and helping those in the medical field recognize it and manage it is bound to improve their mental health and general well-being, which is bound to reflect well on their patient care, which is the ultimate goal.

Aim of study: As such, this study was conducted to assess the occurrence of IP among the medical students of Khartoum University in Sudan in 2022. There are few papers on the topic in Africa and the Middle East region, and none in Sudan. This study aims to help fill this gap. This study intends to shed light on the risk factors that contribute to IP. It also seeks to investigate the mental implications of IP on medical students.

Methodology: This was a cross-sectional study conducted at the University of Khartoum, Faculty of Medicine, in Sudan, involving all the students enrolled in the faculty at the time (7 batches, 2334 students). Using convenience sampling, a sample of 409 students was chosen. The data was collected using a Google form. The data were then analyzed using SPSS software.

Results: In the study sample (409 students), impostor phenomenon was found in 216 students (52.8%). It is higher than the prevalence of a study conducted in Nigeria (54.5%).

The students had a moderate to high prevalence of depression, anxiety, and burnout. The impostor phenomenon was associated with gender. IP was more severe in middle-year students. We formed a model to help in predicting IP, and it had the following items: self-esteem, parental over protection, anxiety, depression, burnout, and perfectionism.

Conclusions: The impostor phenomenon is frequent among medical students at the University of Khartoum and is associated with mental health problems, certain personality traits, and different family dynamics. Efforts to increase awareness and facilitate IP management should be implemented.

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Conflict of Interest Statement & Funding

Ethical approval was taken from community medicine department, University of Khartoum. Consent was taken from the students at the beginning of the Google form. No information leading to the student's identification was taken. As reported in the manuscript.

Author Contributions

Conceptualization: H. K. A. Hamad. Methodology: H. K. A. Hamad. Validation: H. K. A. Hamad. Formal Analysis: H. K. A. Hamad. Data Curation: H. K. A. Hamad. Investigation: H. K. A. Hamad. Resources: H. K. A. Hamad. Writing – Original Draft: H. K. A. Hamad. Writing – Review & Editing: H. K. A. Hamad. Visualization: H. K. A. Hamad. Project Administration: H. K. A. Hamad.

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Original Article

Let's Talk about Bias in Healthcare: Experiences from an Interactive Interprofessional Student Seminar

Mckenzie P. Rowe,[1] Nancy B. Tahmo,[2] Opeoluwa O. Oyewole,[3] Keyonna M. King,[4] Teresa M. Cochran,[5] Yun Saksena,[6] Carolyn T. Williamson,[7] Rev. Portia A. Cavitt,[8] Sheritta A. Strong,[9] Michael D. Griffin,[10] Timothy C. Guetterman,[11] Jasmine R. Marcelin.[9]

Abstract

Background: Education to increase awareness of the impact of bias in healthcare should be included in all health professions training programs. This report describes the implementation and outcomes of an interactive, interprofessional pilot seminar on racial bias in healthcare for health professions students. **Methods:** Forty students across the University of Nebraska Medical Center's six health profession colleges participated in a 3-part, 1-hour seminar, including a video vignette depicting examples of bias in the hospital, facilitated interprofessional small group discussions, and interaction with a health equity expert panel. We analyzed the results of participants' Ethnic Perspective-Taking (EP) and Implicit Bias Knowledge scale (IBKS) scores before and after the seminar. **Results:** There was a statistically significant increase ($p<0.001$) in the average post-seminar EP scores (30.6 post-seminar vs 27.8 pre-seminar). For the adapted IBKS, there were significant improvements in participant knowledge, skills to identify, and ability to explain the impact of implicit biases ($p<0.05$). Participants highlighted the importance of including education about bias in healthcare training, and some suggested mandatory education. All facilitators agreed that learners gained a deeper appreciation for the effect of bias and racism on health outcomes and participants understood how bias and racism affect patient care and clinician experience after the seminar. **Conclusion:** Health professions training often lacks integrated interprofessional and health equity education. This seminar addresses both, engaging community voices without heavy resources. Despite low participation, results show the benefits of interactive sessions on health equity, helping students grasp their role in equitable care and influencing future practice.

Introduction

Unconscious or implicit biases may manifest as either a prejudice (negative evaluation) or stereotype (attribute) that one associates with people who share a particular characteristic.[1,2] Implicit biases exist in healthcare workers, placing minoritized communities at a greater risk for poor health outcomes due to inequities in healthcare access and delivery.[3–8] The Liaison Committee on Medical Education (LCME) has identified standards addressing health inequities and structural/cultural competency in medical schools with a requirement that "medical curriculum provides opportunities for medical students to learn to recognize and appropriately address biases in themselves, in others, and in the health care delivery process."[9] Healthcare training programs have included components of bias training to address structural racism and bias in their curriculum, but these efforts primarily have been siloed in individual professions such as medicine, nursing, or dentistry.[10–14] Quality healthcare delivery, however, is not insulated between professions in this manner. Therefore, a curriculum designed and delivered in an interprofessional setting to interdisciplinary students is essential to creating a structural competency curriculum, and addressing the social determinants of health that lead to health inequities in clinical settings.[15,16]

Our institution's Interprofessional Education (IPE) Curriculum Committee designs activities engaging students and faculty from its different colleges to incorporate interprofessional education into their programs. While a structural competency curriculum exists in the College of Medicine at our institution,[12] there is no similar education incorporated into the existing IPE curriculum. This report aims to describe the implementation and outcomes of an interactive seminar designed to educate interprofessional health professions students to recognize the effect of racial bias on patient care and discuss strategies for mitigating bias in clinical settings. We propose a framework that transcends conversation between academic health disciplines, to include community partners that our health system serves. A review of IPE within colleges suggests that there is a limited commitment to community and patient partner involvement in health profession education; this report highlights the transformative

[1] MD. Inova Fairfax Medical Campus, Falls Church, USA
[2] MPH. University of Toronto, ON, CA
[3] Ph.D. California Council on Science and Technology, Sacramento, USA
[4] DrPH, MA. University of Nebraska Medical Center, Omaha, USA
[5] DPT, MA. University of Nebraska Medical Center, Kearney, USA
[6] DMD. University of Nebraska Medical Center, Lincoln, USA
[7] Community Leader, Omaha, USA
[8] Pastor, Clair Memorial United Methodist Church, Omaha, USA
[9] MD. University of Nebraska Medical Center, Omaha, USA
[10] MPH. University of Nebraska Medical Center, Omaha, USA
[11] Ph.D. University of Michigan, Ann Arbor, USA

About the Author: *Mckenzie Rowe is currently a second-year general surgery resident at Inova Fairfax Hospital in Falls Church, Virginia. She graduated from the University of Nebraska Medical Center in May 2022.*

Correspondence:
Mckenzie P. Rowe.
Address: Campus is 3300 Gallows Road, Falls Church, VA 22042, USA.
Email: mckenzie.rowe@inova.org

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influence in health profession students' appreciation of health inequities among those we serve.[17]

Methods

Setting and Participants

The event was held in March 2022. We recruited students via email, electronic newsletters, social media announcements, and word of mouth. Participation was limited to enrolled students from one of the six health professions colleges across our institution. We incentivized voluntary, in-person attendance with complimentary lunch, and Zoom conferencing allowed participation from remote campuses. In 2021, 2.8% and 4.9% of our institution's students self-identified as Black or Hispanic, respectively. These two racial/ethnic groups represent 12.1% and 11.3% of residents where most of our institution's colleges are based

Seminar Development and Implementation

This interprofessional seminar aimed to help students apply strategies to increase awareness and mitigate racial bias in clinical cases. Box 1A outlines the learning objectives reflecting the Values/Ethics and Teams/Teamwork domains of the core competencies for the Interprofessional Education Collaborative (IPEC).[21] As with prior curricular innovations in our institution, community stakeholders were included as an integral part of the team to assist with seminar planning, implementation, and follow up.[12] Other team members included students, faculty, and staff representing various health professions colleges from our institution. The 60-minute seminar included a pre-recorded video vignette (11 minutes), facilitated small group discussions (25 minutes), and a 15-minute discussion panel ***(Box 1B).***

Video Vignette Creation

We utilized the five-stage framework originally described by Hillen et al.[18] to create our video vignette, which has been used in several other studies.[19-20] This process involves (1) deciding if video vignette is appropriate; (2) developing a script; (3) developing valid manipulations; (4) converting the script to video; (5) administering the videos. Video vignettes are often used in health communications studies and was chosen for this seminar to portray true-to-life examples of bias in healthcare (incorporating non-verbal and verbal communication) for those with minimal experience in clinical setting, and to facilitate better participant engagement.[17]

The scenario depicted racial bias in an interaction between a nurse and a patient with sickle cell disease (SCD) experiencing a pain crisis.[22] Volunteer actors were recruited from our institution and another local college. It would be unethical to intentionally subject real patients to hurtful language and actions; therefore, a vignette was an appropriate choice for our chosen topic and audience. The script was created based on real interactions and experiences, and was edited by subject experts, real prior patients, and a professional filmmaker. We utilized both real healthcare professionals from our institution and actors recruited from a local college to create the scenes, which were filmed in simulated patient rooms. The third person camera view (rather than first person) captured the full range of verbal and nonverbal interactions between the characters. A professional film director edited the film, which was reviewed by our multidisciplinary advisory team for feedback. The video was viewed in a group setting but with cinematic viewing conditions (a large screen and in darkness), as this was more practical than individual viewing but still allowed for better immersion into the scenarios.

Facilitator Training

Seminar facilitators included faculty members recruited from several colleges and across multiple campuses, representing both clinical and academic expertise; community leaders also served as facilitators and expert panelists. Facilitators participated in a one-hour training session two days prior to the event, which included viewing the video scenario followed by walking through the Facilitator Guide ***(Supplemental Figure 1)***, Small Group Discussion Guide ***(Supplemental Figure 2),*** and the open-ended discussion prompts (Box 1B). Small groups consisted of 4-6 students from various health programs per facilitator, with 12 facilitators total.

Program Evaluation

Our institution's Institutional Review Board deemed this a program evaluation and not human subjects research. To gauge the effectiveness of the program, the Kirkpatrick Evaluation Model's framework was used, incorporating scales to measure knowledge of unconscious bias and evaluating learning. Open ended questions with qualitative results provided insight into participants' reactions. Facilitator observations of students helped to further assess behavior and results. Voluntary, anonymized, web-based surveys were disseminated to participants in the three days before and after the seminar ***(Supplemental Figure 3).*** Each participant was assigned a unique code to link pre-and post-seminar survey responses. The surveys assessed (1) participant demographics, (2) perceptions and interest in learning more about bias through examples of bias in healthcare, (3) knowledge and awareness of bias using adapted scales, and (4) seminar strengths and opportunities for improvement. An additional post-evaluation survey assessed facilitator perceptions of learner knowledge, skills, and attitudes following the training ***(Supplemental Figure 4).***

Scales to measure knowledge of unconscious bias

To align with the seminar objectives, the effectiveness of the program was characterized based on improvement in ethnic perspective-taking scores and implicit bias knowledge of participants pre- and post-seminar. Ethnic perspective-taking is the process of individuals seeking and actively considering the thoughts, experiences, and feelings of racial/ethnic outgroups.[23,24] Studies have demonstrated the interrelation between perspective-taking as an antecedent to racial bias.[25–27] The Ethnic Perspective-Taking (EP) subscale of the Scale of Ethnocultural Empathy (SEE) assessed participants' "effort to understand the experiences and emotions of people from different racial and ethnic backgrounds."[2] This is a 7-item

subscale with 6-point Likert-type responses ranging from '1' being 'strongly disagree' to '6' being 'strongly agree' ***(Figure 1)***. A total score was computed and compared for each participant pre- and post-seminar. A higher score corresponds to greater ethnic perspective-taking. The original instrument's internal consistency was 0.90.

Participant implicit bias knowledge was assessed with an adapted Implicit Bias Knowledge Scale (IBKS)[29]. The original scale included 18 items. To shorten the survey and increase completion rates, our adaptation removed 8 items and revised two items to replace juvenile justice text with healthcare text (e.g., "Youth of all races and ethnicities are treated the same in local schools" was reworded to "People of all races and ethnicities are treated the same in healthcare") for a total of 10-items administered in our survey. The adapted set of questions was reviewed by subject matter experts (content validation). The participants responded to the statements as either 'True' or 'False.' The internal consistency of the original scale was 0.74. Given our small sample size and the nature of the questions themselves, we did not analyze the results as a scale and calculate Cronbach's alpha, but rather, looked at answer changes to individual questions.

Analyses

We conducted the Kolmogorov-Smirnov test for normality, and because data were normally distributed, we conducted a paired-samples *t*-test to compare EP scores for matched pre- and post-surveys using a significance level of 0.05 as reference. For the adapted IBKS, we used descriptive statistics and the Chi-squared test to describe the differences in participant response to each question at pre- and post-seminar. We conducted an inductive thematic analysis of open-ended survey responses.[30] Two researchers (MR and NT) independently analyzed the responses by identifying codes and corresponding themes, with subsequent revision and agreement by two senior researchers (KK and TG). The researchers met to discuss their individual codes and themes until they reached consensus

Results

Student evaluation

Of the 45 registered student participants, 40 attended including 10 (25.0%) attending virtually. Eighty percent (n=32) self-identified as women and 57.5% (n=23) aged 25 to 30 years ***(Table 1)***. Sixty-five percent of the students self-identified as White, 10.0% as Asian, 7.5% as Black/African American, 7.5% as Hispanic/Latino, and 7.5% as Multiracial. Almost half (47.5%) were third- or fourth-year students, and most participants came from the College of Medicine (35.0%). Half (n=20, 50.0%) of the participants completed the pre- and post-seminar surveys; these results were compared for the EP and adapted IBKS.

For the EP scale, there was a statistically significant increase in the mean post-seminar score (M = 30.6, SD = 5.6, p<0.001, 95% CI [4.33, 1.27], d=.86; range 22-42), compared with the pre-seminar score (M = 27.8, SD = 6.8; range 17-39), demonstrating learning ***(Figure 1)***. Furthermore, post-seminar scores skewed higher than pre-seminar scores, with a majority of the post-seminar responses higher than the pre-seminar score median. For the adapted IBKS, there was a significant improvement in knowledge and ability to address implicit biases ***(Table 2, Figure 2)***. At the end of the seminar, 19/20 participants vs. 10/20 pre-seminar felt they had the skills to identify solutions to their implicit biases (p<0.001); 20/20 vs 15/20 felt knowledgeable about implicit bias (p<0.05); and 16/20 vs 6/20 felt qualified to explain the impact of implicit bias to others (p<0.001).

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Table 4 shows the joint display integrating qualitative and quantitative results, drawing from participants' responses to open-ended survey questions. Participants agreed that implicit bias was present in most people and that training to enable students to understand it and its negative effects on healthcare delivery is essential.

Facilitator Evaluation

All 12 facilitators responded to the evaluation questionnaire, and 100.0% agreed or strongly agreed that learners gained a deeper appreciation for the effect of bias and racism on health outcomes. Most facilitators also noted that students' knowledge (58.0% of facilitators, n=7) and skills indicating behavioral change and desired results (75.0% of facilitators, n=9) improved due to the seminar. They all strongly or very strongly agreed that participants understood how bias and racism affect patient care and clinician experience. Fifty-eight percent (n=7) thought that using a video vignette and guided discussion prompts for facilitators effectively promoted student engagement and thoughtfulness in the small group discussions. They highlighted the mix of panel discussion and small group discussions as unique, saying "Small group structure allowed for open discussion of bias. Students were open and willing to discuss. It was evident from discussion [that] students identified salient points on recognizing and dealing with bias."

Discussion

It is important to address bias in healthcare given its negative impacts on patient outcomes and the potential for perpetuation among healthcare professionals. Sun et al. reported that Black patients had 2.54 times the odds of having a negative descriptor

in their medical record compared with White patients.[31] Exposure to stigmatizing language through the medical record was associated with more negative attitudes towards patients[32-33] and less aggressive pain management in patients with sickle cell disease.[34] Whether bias manifests through written records or verbal handoffs, these studies highlight the need for further anti-bias training in interprofessional settings to mitigate these behaviors and avoid inequitable treatment.

Table 1. Bias in Healthcare Seminar Participant Characteristics (N=40).

	N (%)
Age	
18-24	14 (35.0)
25-30	23 (57.5)
31-40	3 (7.5)
Gender	
Woman	32 (80.0)
Man	8 (20.0)
Nonbinary/other	0
Racial/ethnic identity	
Asian	4 (10.0)
Black/African American	3 (7.5)
Hispanic/Latino	3 (7.5)
White	26 (65.0)
Multiracial/Biracial	3 (7.5)
No disability	39 (97.5)
Member of the LGBTQ+ community	8 (20.0)
Year in school	
1	9 (22.5)
2	10 (25.0)
3	12 (30.0)
4	7 (17.5)
College affiliation	
CAHP	8 (20.0)
COD	3 (7.5)
COM	14 (35.0)
CON	1 (2.5)
COP	3 (7.5)
COPH	2 (5.0)
Graduate Studies	6 (15.0)
Others*	4 (9.6)

*Others include MD-PhD scholars
College of Allied Health Professions (CAHP), College of Dentistry (COD), College of Graduate Studies (CGS), College of Medicine (COM), College of Nursing (CON), College of Pharmacy (COP), and College of Public Health (COPH)

As a university with several health professions programs, IPE has been an important initiative for several years at our institution.[35] Although structural competency education is now required of many health professions degrees, this was not previously incorporated into the IPE curriculum, rather, addressed by individual colleges within their specific curricula. This student-developed "Bias in Healthcare" Seminar successfully introduced interdisciplinary health professions students to a realistic clinical scenario and provided a framework to navigate racial bias in healthcare. As a pilot study, one of the main goals was to trial this structure (video, discussion, panel) as an effective way to learn about this topic. Based on responses to the surveys, students agreed that it was, and encouraged interdisciplinary bias training to be included into the mandatory curriculum. The seminar addressed gaps in structural competency curricula in an engaging way while building interprofessional relationships.

The seminar evaluation indicated a significant increase in participant empathy towards people of racial/ethnic backgrounds different from their own, as well as increased knowledge of and ability to address the impact of implicit bias. The varied learning modalities promoted increased participant engagement. The video vignette provided specific examples for those with limited clinical experience and provided a foundation for further discussion. Interprofessional small groups provided a safe environment to reflect with peers in a setting similar to the interdisciplinary clinical team. The expert panel permitted students to learn about others' experiences with bias directly and through several lenses, including community concerns and institutional challenges. The sum of these experiences allowed students personal and professional growth by providing knowledge and opportunities for reflection and interaction with peers and community members.

Box 1. Seminar Learning Objectives and Schedule/Implementation.

1A. Learning Objectives (LOs) addressed with the Interprofessional Bias in Healthcare Webinar

(LO1) Describe the effect of bias and race-based healthcare on patient care.

(LO2) Create an environment of inclusive excellence by listening actively and encouraging the ideas and opinions of other team members.

(LO3) Discuss how to recognize and react to bias in yourself and others.

(LO4) Recognize appropriate language for having discussions about bias in health care.

1B. Seminar Schedule/Implementation

12:00 – 12:10 pm: Welcome remarks/ Session overview/ Lunch distribution
12:10 – 12:20 pm: Viewing of video vignette (large group)
12:20 – 12:45 pm: Facilitated small group discussions (eight groups in person [one of these at a satellite campus]; five virtual group meetings via Zoom conferencing). Below are some of the discussion questions used to guide conversation:

- Can you identify examples of bias in this video?
- Discuss examples of bias in healthcare you've experienced (or witnessed)?
- What could you learn from the discussion about bias in the last scene?
- Should Dr. J have specifically pointed out the comment about Black people having a higher pain tolerance? What would that conversation look like?
- Is it important to use the word "racism" when you see it happen? Are there situations that would be more or less appropriate to do this? Why or why not?

12:45 – 1:00 pm: Healthcare Equity Experts panel and dismissal

Legend: Box plot showing the pre- and post-seminar responses to the Ethnic Perspective-taking survey questions. t-test = 3.83 (***p≤0.001) when comparing pre- and post-seminar mean scores. Note that higher scores indicate greater ethnic perspective-takin.

Table 2. Adapted Implicit Bias Knowledge Scale Responses (N=20)

	Pre-seminar True Response	Post-seminar True Response	Difference	CI Lower Bound	CI Upper Bound	Effect Size
Question	N (%)	N (%)	N (%)			
1. People of all races and ethnicities have access to the same resources in my city.	2 (10.0)	0 (0.0)	2 (10.0)	2.1	.15	.32
2. People of all races and ethnicities are treated the same in healthcare.	0 (0.0)	0 (0.0)	0 (0.0)	-	-	-
3. Everyone (including me) has implicit biases.	20 (100.0)	20 (100.0)	0 (0.0)	-	-	-
4. Biases can extend beyond racial/ethnic group characteristics.	20 (100.0)	20 (100.0)	0 (0.0)	-	-	-
5. Even if our attitudes and beliefs come from our culture, they can be changed.	20 (100.0)	20 (100.0)	0 (0.0)	-	-	-
6. We can manage microaggressions by becoming aware of them, and slowly learning to catch our biases before they become actions.	19 (95.0)	20 (100.0)	1 (5.0)	1.0	.31	.22
7. I feel I have the skills needed to identify a solution for my implicit biases.	10 (50.0)	19 (95.0)	9 (45.0) ***	10.2	.001	.71
8. I feel knowledgeable about implicit bias.	15 (75.0)	20 (100.0)	5 (25.0) *	5.7	.02	.53
9. I am uncomfortable to have conversations about bias with others.	7 (35.0)	6 (30.0)	1 (5.0)	.11	.74	.07
10. I feel qualified to explain the impact of implicit bias to others.	6 (30.0)	16 (80.0)	10 (50.0) ***	10.1	.001	.71

N= Number of "True" responses, which at times shows more or less implicit bias knowledge, depending on the question; ***p<.001, *p<.05; "-" indicates constant values for the item

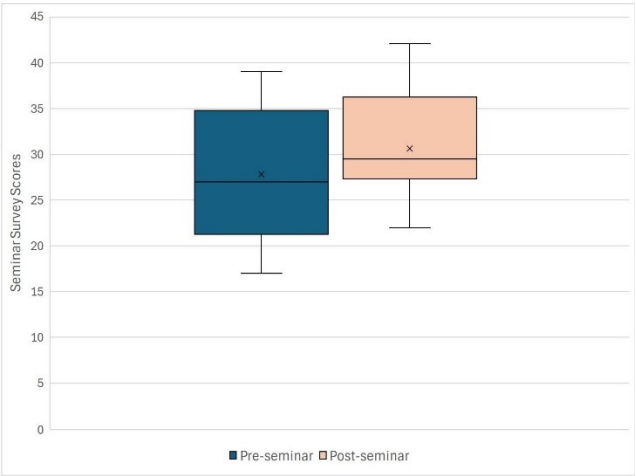
Incorporating community members' voices is necessary when crafting viable solutions to healthcare challenges, including creating educational content.[36–40] They offer valuable insight to students by allowing participants to hear directly from the people they will serve. This provides an understanding of the impact of their care in a way that traditional classroom lectures cannot. This seminar prioritized community engagement from project conception and production to implementation to ensure more effective training and realistic experience for students. Other institutions should consider incorporating community voices into student training where feasible.

Limitations

This program was an optional, single-session student seminar implemented and evaluated at a single institution with a small sample size, which may limit generalizability. Conducting similar studies at multiple institutions could enhance generalizability. Strategies to improve participation could include additional participant incentives and adjusting the timeframe of the seminar to allow for strategic survey completion in-person before and after the seminar using QR codes. There was also no control group; inclusion of this could have strengthened findings. Voluntary seminar participation may have led to a self-selection bias towards individuals who already exhibit baseline knowledge and empathy regarding bias in healthcare. While we obtained both pre- and post-seminar evaluations, these did not assess the long-term impact of the seminar on participants, and unmatched post-seminar evaluations limited assessments of change of evaluation scores for 50.0% of participants. Future research

should include longitudinal assessments to measure the lasting impact of the seminar. The seminar was planned and executed during the COVID-19 pandemic, resulting in unique challenges with volunteer participation and partial virtual participation. Lastly, as a pilot the seminar's scope was limited to racial bias and does not represent the full spectrum of bias patients may experience in healthcare.

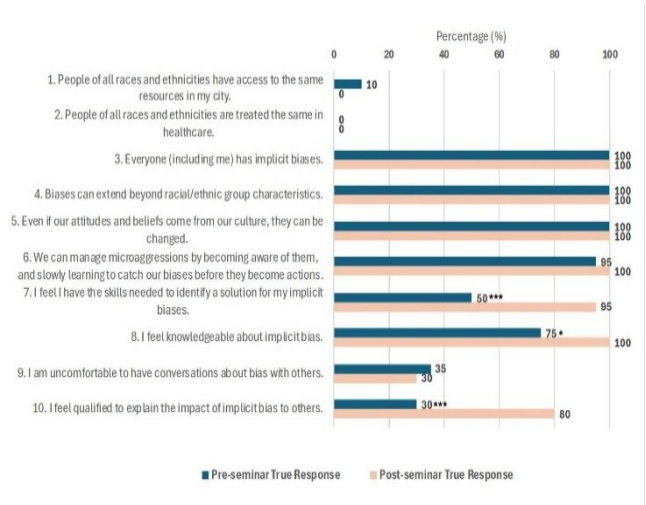
Figure 1. Ethnic Perspective-Taking Score Comparisons (N=20)



	Pre-seminar scores	Post-seminar scores
Mean (SD)	27.8 (6.8)	30.6 (5.6)***
Median (3rd quartile-1st)	27.0 (34.7-27.2)	29.5 (36.2-27.2)
Range (max-min)	22 (39-17)	20 (42-22)

Legend: Box plot showing the pre- and post-seminar responses to the Ethnic Perspective-taking survey questions. t-test = 3.83 (***p≤0.001) when comparing pre- and post-seminar mean scores. Note that higher scores indicate greater ethnic perspective-taking.

Figure 2. Adapted Implicit Bias Knowledge Scale Responses (N=20).



Legend: Bar graph showing the percentage of true responses from seminar participants pre- and post-seminar (***p<.001, *p<.05). N= "True"responses, which at times shows more or less implicit bias knowledge, depending on the question.

Table 3. Themes of Student Perceptions Regarding Racial Bias and the Seminar

Themes Subthemes	**Representative Comments (Participant Role/Number)**
Existing inadequate or insufficient bias training	
Necessity of such programs in health professionals' training	"…It's essential that all students learn about bias in healthcare as many patients, particularly those of racial and ethnic minority groups, often do not receive quality care because their experiences are overlooked. Learning about bias can reduce negative experiences of all patients." (Student 19) "I think [bias in healthcare] is very important. I really think this type of experience should be mandated for future healthcare professionals. To help combat bias people need to first understand that they have bias (even if they don't realize it)." (Student 3)
Traditional health training does not address implicit bias	"I want more concrete examples of how bias manifests in healthcare settings…I want more opportunities to practice addressing my own implicit biases, because practice is going to be the only way I get better at acknowledging and working to change my implicit biases as I'm working as a health care provider." (Student 21)
Strengths of Seminar	
Video vignette provided tangible examples	"It was so helpful to have a video with specific examples to reflect on together, and it helped many people in our discussion group recall similar personal experiences that they shared." (Student 15)
Small focus group discussions	"The small group discussion and expert panel were the most helpful but also would not have been as helpful without the video vignette preceding them. Since these bias problems center around people-to-people interactions I think discussing and communicating with others is the best way to learn and grow in this area." (Student 3)
In-person experience	"For me, an in-person setting for this event in particular was so valuable. There was a level of connection and understanding between our group members that I feel would have been lost in an online format." (Student 15)
Suggested improvements to/expansion of seminar	
Increasing allotted time for certain training components	"I would have loved if there was more time for the discussion and the expert panel!" (Student 7)
Provide support material to participants with actionable steps	"Her verbiage was excellent. I would love a transcript of some of the phrases she used. That was something I felt this session lacked - there was an elevation of awareness, but I didn't feel I walked away with specific tools I could use in the real world." (Student 22)
Suggestions for expanding sessions	"I just think this should be expanded upon—a video vignette and conversation about 1) LGBTQIA patients, 2) Patients with strict cultural norms that we think of as "strange", 3) Low SES patients we may have a socioeconomic bias toward." (Student 18)

Legend: Participant comments categorized into themes and subthemes with examples.

Table 4. Joint Display of Qualitative and Quantitative Results.

Key Quantitative Results	Key Related Qualitative Results	Interpretation
"Everyone (including me) has implicit biases" *No change in pre- and post-seminar responses*	*Increased awareness of implicit bias* "My main takeaway was that implicit bias is present before we ever even meet the patient and that needs to be actively worked against." (Student 6)	Participants recognized the existence of bias in themselves and others and noted that training such as the seminar should be integral to an education in healthcare.
"Biases can extend beyond racial/ethnic group" characteristics *100% of respondents agreed both pre- and post-seminar. No change in pre- and post-seminar responses*	*Current bias training is inadequate, and participants were interested in learning more about potential biases.* "Everyone did great. I just think this should be expanded upon—a video vignette and conversation about 1) LGBTQIA patients, 2) Patients with strict cultural norms that we think of as "strange", 3) Low SES patients we may have a socioeconomic bias toward." (Student 18) "I think we need programs like this more often, with greater variety of subject material covered..." (Student 18)	A participant called for bias training to extend beyond race and ethnicity to include other marginalized groups.

Legend: Includes a selection of quantitative and qualitative results displayed jointly; qualitative results come from the Adapted Implicit Bias Knowledge Scale while the quotes are from the participants' responses to open-ended survey questions.

Future Seminars/Next Steps

Based on post-seminar feedback, future seminars will be expanded to 1.5 hours with a goal of full incorporation into the IPE curriculum which would make the seminar mandatory, leading to a more diverse participant pool and mitigating self-selection bias. Further emphasis on illustrating strategies to address bias in situations within a power differential as the subordinate would be beneficial for the student population. Longer-term goals include offering seminars to faculty and staff excluded from this pilot, which focused on student learners. Data could be gathered of student performance in the clinical setting relating to treatment of patients with or without bias, months or years post-seminar to determine the longer-term impact/results of seminars (Kirkpatrick Model's level 4). Furthermore, the program produced high-quality videos that can be directed for use in on-demand learning on this topic.

Anti-bias curricula for health professions students are an important part of the educational experience, as the reality of downstream health implications for patients may not be easy to envision for students with limited clinical experience if this is not explicitly addressed. Building on interactive, interprofessional approaches with realistic examples can allow students with limited clinical experience to improve their delivery of care. Understanding these topics and how to address them is key to being a well-rounded clinician who provides patient-focused care. Institutions should build on this framework as they create content for both anti-bias and interprofessional training.

Summary – Accelerating Translation

This report discusses the successful implementation and outcomes of an interactive, interprofessional pilot seminar addressing racial bias in healthcare for health professions students. The seminar aimed to raise awareness and provide strategies to mitigate bias in healthcare, contributing to the broader goal of fostering equitable patient care.

In the seminar, 40 students participated in a 1-hour session comprising a video vignette, interprofessional small group discussions, and interaction with a health equity expert panel. Pre- and post-seminar assessments measured Ethnic Perspective-Taking (EP) and an adapted Implicit Bias Knowledge Scale (IBKS) to evaluate the impact on participant empathy and knowledge. Qualitative feedback was gathered to further assess the effectiveness of the seminar.

The findings revealed a significant increase in post-seminar EP scores, indicating improved empathy towards racial and ethnic diversity. The adapted IBKS demonstrated significant enhancements in participant knowledge in certain areas regarding implicit bias. Participants advocated for the inclusion of bias education in healthcare training, emphasizing the seminar's effectiveness in promoting awareness and understanding of bias. Facilitators reported that learners developed a deeper appreciation for the effects of bias and racism on health outcomes. Most facilitators observed improvements in student knowledge and skills, highlighting the seminar's success in achieving its educational objectives.

The seminar addressed the critical need for both interprofessional and health equity education in health professions training. By incorporating community voices and realistic examples, the seminar engaged students effectively without requiring significant resources for those who would replicate this experience.

Limitations of the study include its single-session format and a focus on racial bias. Future seminars plan to expand in duration, address power differentials, and target faculty and staff. The high-quality videos produced during the program offer valuable resources for on-demand learning on this critical topic.

In conclusion, this interactive, interprofessional seminar effectively promotes understanding of the impact of bias on patient care, fostering awareness and promoting equitable care delivery in health professions education

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Supplementary Material

Let's Talk about Bias in Healthcare: An Interactive Interprofessional Student Educational Experience

Principal Investigators: Mckenzie Rowe and Jasmine R. Marcelin, MD

Dear Student Colleague,

Thank you for participating in the Let's Talk about Bias in Healthcare interactive interprofessional student educational experience. We invite you to complete this survey to help us to evaluate the value of this experience and achievement of educational objectives. The primary physical location of this survey is the University of Nebraska Medical Center. You are eligible to participate in this 5-minute survey because you are a health professions student currently enrolled at UNMC.

The survey is connected to the interprofessional educational experience "Let's Talk about Bias in Healthcare", where students have facilitated group discussions about bias in healthcare prompted by a video vignette viewing. This survey will assess your understanding of bias in healthcare before and after the experience, as well as your evaluation of the program itself.

This survey has been reviewed by the University of Nebraska Medical Center Institutional Review Board and deemed exempt (IRB # XXXX-XX). If you have questions about the rights of research subjects, please contact the Institutional Review Board at https://www.unmc.edu/irb/about/contact.html

Your participation in this survey is voluntary and your responses will be confidential and anonymous. No personal identifiable information will be collected for this study. You will not receive personal benefit from completing the survey, however data from the survey will inform us of the value of the program and ways to improve education about bias, which has societal benefits. Participation or the refusal to participate will have no effect on academic standing.

Completion of the survey will be considered an agreement to participate in the research study. Participants may choose to skip questions they do not wish to answer and may choose to cease participation at any time.

If you have questions about the survey, please contact
Mckenzie Rowe M4 (mailto:mckenzie.rowe@unmc.edu)
or Jasmine Marcelin, MD (mailto:jasmine.marcelin@unmc.edu).

Thank you for considering participating in this survey!

Pre-Educational Experience Survey

We are de-identifying your information to ensure confidentiality. Before you answer the assessment questions below, please create your personal code using the following questions:

1. What day of the month were you born?
(e.g. If your birthday is November 17, put "17")

2. What is the first letter of your middle name?
(If you don't have a middle name, please use "F")

3. How many OLDER siblings do you have?

4. What is the first letter of the state that you were born in?
(If you were born outside of the United States use "H")
Your code: _____

Demographic Information

1. Age: [ ]18-24 [ ]25-30 [ ]31-40 [ ]41-50 [ ]51-60 [ ]>60
2. To which gender identity do you most identify with: [ ] Man [ ] Woman [ ] Trans-gender man []Trans-gender woman [ ] Nonbinary [ ] Another gender not described
[ ] Prefer not to answer

3. Which best describes you? (Please select one answer): [ ] White/Caucasian [ ] Hispanic/Latino [ ] Black/African American [ ] Asian [ ] Pacific Islander/Native Hawai'ian [ ] American Indian/Alaskan Native [ ] Multiracial/Biracial [ ] A race/ethnicity not listed above (please specify) _____
4. Do you identify as a member of the LGBTQ+ community? (Yes, No, Prefer not to answer)
5. Do you identify as a member of the disability community? (Yes, No, Prefer not to answer)
6. Primary college affiliation: [ ]College of Medicine [ ]College of Nursing [ ]College of Public Health [ ]College of Dentistry [ ]College of Allied Health Professions [ ]College of Pharmacy [ ]Graduate Studies [ ]Postdoctoral Education [ ]Other
7. Year in School: [ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]6 [ ]7+

Using the following scale, please rate your ability for each of the following statement:
1=Poor 2=Fair 3=Good 4=Very good 5=Excellent
1. Use respectful language appropriate for a given difficult situation, crucial conversation, or conflict.

Using the following scale, please rate how each statement describes you:
1 = Strongly disagree
2 = Disagree
3 = Somewhat disagree
4 = Somewhat agree
5 = Agree
6 = Strongly agree

	Questions						
a.	It is easy for me to understand what it would feel like to be a person of another racial or ethnic background other than my own.	1	2	3	4	5	6
b.	It is difficult for me to relate to stories in which people talk about racial or ethnic discrimination they experience in their day to day lives. (R)	1	2	3	4	5	6
c.	It is difficult for me to put myself in the shoes of someone who is racially and/or ethnically different from me. (R)	1	2	3	4	5	6
d.	I know what it feels like to be the only person of a certain race or ethnicity in a group of people.	1	2	3	4	5	6
e.	I can relate to the frustration that some people feel about having fewer opportunities due to their racial or ethnic backgrounds	1	2	3	4	5	6
f.	I feel uncomfortable when I am around a significant number of people who are racially/ethnically different than me. (R)	1	2	3	4	5	6
g.	I don't know a lot of information about important social and political events of racial and ethnic groups other than my own. (R)	1	2	3	4	5	6

Choose if the statement is True or False

True	**False**	1. People of all races and ethnicities have access to the same resources in my city.
True	**False**	2. People of all races and ethnicities are treated the same in healthcare.
True	**False**	3. Everyone (including me) has implicit biases.
True	**False**	4. Biases can extend beyond racial/ethnic group characteristics.
True	**False**	5. Even if our attitudes and beliefs come from our culture, they can be changed.
True	**False**	6. We can manage microaggressions by becoming aware of them, and slowly learning to catch our biases before they become actions.
True	**False**	7. I feel I have the skills needed to identify a solution for my implicit biases.
True	**False**	8. I feel knowledgeable about implicit bias.
True	**False**	9. I am uncomfortable to have conversations about bias with others.
True	**False**	10. I feel qualified to explain the impact of implicit bias to others.

Free-Form Questions

1. What are your thoughts on learning more about bias in healthcare?

2. What are some ways bias affects patient care?

Thank you for taking the time to complete this survey

Post-Training Survey

We are de-identifying your information to ensure confidentiality. Before you answer the assessment questions below, please create your personal code using the following questions:

1. What day of the month were you born?
(e.g. If your birthday is November 17, put "17")

2. What is the first letter of your middle name?
(If you don't have a middle name, please use "F")

3. How many OLDER siblings do you have?

4. What is the first letter of the state that you were born in?
(If you were born outside of the United States use "H")
Your code: _____

Demographic Information

1. Age: [ ]18-24 [ ]25-30 [ ]31-40 [ ]41-50 [ ]51-60 [ ]>60

2. To which gender identity do you most identify with: [ ] Man [ ] Woman [ ] Trans-gender man []Trans-gender woman [ ] Nonbinary [ ] Another gender not described
[ ] Prefer not to answer

3. Which best describes you? (Please select one answer): [ ] White/Caucasian [ ] Hispanic/Latino [ ] Black/African American [ ] Asian [ ] Pacific Islander/Native Hawai'ian [ ] American Indian/Alaskan Native [ ] Multiracial/Biracial [ ] A race/ethnicity not listed above (please specify) _____

4. Do you identify as a member of the LGBTQ+ community? (Yes, No, Prefer not to answer)

5. Do you identify as a member of the disability community? (Yes, No, Prefer not to answer)

6. Primary college affiliation: [ ]College of Medicine [ ]College of Nursing [ ]College of Public Health [ ]College of Dentistry [ ]College of Allied Health Professions [ ]College of Pharmacy [ ]Graduate Studies [ ]Postdoctoral Education [ ]Other

7. Year in School: [ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]6 [ ]7+

Using the following scale, please rate your ability for each of the following statement:
1=Poor 2=Fair 3=Good 4=Very good 5=Excellent

2. Use respectful language appropriate for a given difficult situation, crucial conversation, or conflict.

Using the following scale, please rate how each statement describes you:

1 = Strongly disagree
2 = Disagree
3 = Somewhat disagree
4 = Somewhat agree
5 = Agree
6 = Strongly agree

	Questions						
a.	It is easy for me to understand what it would feel like to be a person of another racial or ethnic background other than my own.	1	2	3	4	5	6
b.	It is difficult for me to relate to stories in which people talk about racial or ethnic discrimination they experience in their day to day lives. (R)	1	2	3	4	5	6
c.	It is difficult for me to put myself in the shoes of someone who is racially and/or ethnically different from me. (R)	1	2	3	4	5	6
d.	I know what it feels like to be the only person of a certain race or ethnicity in a group of people.	1	2	3	4	5	6
e.	I can relate to the frustration that some people feel about having fewer opportunities due to their racial or ethnic backgrounds	1	2	3	4	5	6
f.	I feel uncomfortable when I am around a significant number of people who are racially/ethnically different than me. (R)	1	2	3	4	5	6
g.	I don't know a lot of information about important social and political events of racial and ethnic groups other than my own. (R)	1	2	3	4	5	6

Choose if the statement is True or False

True False	1. People of all races and ethnicities have access to the same resources in my city.
True False	2. People of all races and ethnicities are treated the same in healthcare.
True False	3. Everyone (including me) has implicit biases.
True False	4. Biases can extend beyond racial/ethnic group characteristics.
True False	5. Even if our attitudes and beliefs come from our culture, they can be changed.
True False	6. We can manage microaggressions by becoming aware of them, and slowly learning to catch our biases before they become actions.
True False	7. I feel I have the skills needed to identify a solution for my implicit biases.
True False	8. I feel knowledgeable about implicit bias.
True False	9. I am uncomfortable to have conversations about bias with others.
True False	10. I feel qualified to explain the impact of implicit bias to others.

Post- Educational Experience Free- Form Questions

1. After participating in the educational experience, describe your thoughts on learning about bias in healthcare.
2. After participating in the educational experience, describe your thoughts about ways bias affects patient care?
3. What was most helpful to your learning about bias in healthcare in this event? (e,g. video vignette, small group discussion, expert panel)
4. What were some of the areas of improvement for this event? (e.g. video vignette, small group discussion, expert panel) Please describe.

Would you be willing to participate in a brief interview regarding your experience? Please click this link if yes.

https://forms.office.com/Pages/ResponsePage.aspx?id=QImihGS0w0G6O7T6ZmW8BXq6NPJAv8ZLu1FTGtsV3ARUMDAxUDZWWDZVM1NWRE9YOUozOEhDN1dQWS4u

Thank you for taking the time to complete this survey

Let's Talk about Bias in Healthcare: Facilitator Evaluation Survey

1. I felt that learner knowledge and/or skills have been improved by today's activities, with respect to their ability to:

	Hardly at all	To a small degree	To moderate degree	To a great degree	To a considerable degree
Understand how bias and racism can affect patient care.	◯	◯	◯	◯	◯
Understand how bias and racism can affect healthcare providers' experiences.	◯	◯	◯	◯	◯

Understand how to recognize bias and take steps to mitigate it.	◯	◯	◯	◯	◯
St0atement 4.	◯	◯	◯	◯	◯

2. Rate the degree to which you agree/disagree with the following statements:

	Strongly	Disagree	Neutral	Agree	Strongly agree
After this activity, learners gained a deeper appreciation for the effect of bias and racism on health outcomes.	◯	◯	◯	◯	◯
After this curriculum, learners felt more comfortable in their ability to talk about bias and racism in a clinical setting.	◯	◯	◯	◯	◯
This curriculum increased learners' desire to understand health inequities in our community.	◯	◯	◯	◯	◯
This curriculum increased learners' desire to speak up when they witness or experience bias.	◯	◯	◯	◯	◯
Learners perceived the topics covered as an important part of their education to become a good healthcare provider.	◯	◯	◯	◯	◯
Learners were interested in pursuing (or intend to pursue) additional training on one or more topics covered in this curriculum.	◯	◯	◯	◯	◯

3. Rate the degree to which you agree/disagree with the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Prior to today, learners already had a strong knowledge base on the topics covered in the activities.	◯	◯	◯	◯	◯
Learner interest in the topics covered in today's activities did not change much.	◯	◯	◯	◯	◯
Learner attitudes about the topics covered in today's activities did not change much.	◯	◯	◯	◯	◯

4. Please comment on the strengths of today's curriculum:

5. Please provide your suggestions for how today's curriculum may be improved:

6. What role(s) do you hold that led to your being invited to help facilitate this interprofessional student educational experience?

- ◯ UNMC clinical faculty member
- ◯ UNMC administrator
- ◯ - Other UNMC faculty / staff member
- ◯ - Nebraska Medicine administrator / staff member
- ◯ - Community member
- ◯ - Employee of a health-related community organization
- ◯ - Other: _____

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Original Article

Sport and Exercise Medicine: a Misunderstood Specialty Among Medical Students and Foundation Doctors

Bonar McGuire,[1] Hassan Mahfouz,[2] Harry Lorenz,[3] Edward Archer.[4]

Abstract

Objectives: To assess medical students' and foundation doctors' understanding of Sport and Exercise Medicine (SEM) and SEM careers; to gauge this cohort's physical activity (PA) level and awareness of PA guidelines. **Design and Methods:** An anonymised online survey was distributed to medical students and foundation trainees between 28th October 2022 and 20th January 2024. **Results:** 144 respondents completed the survey. 72.2% were students. 87.5% were aware of SEM. While 98.6% knew that SEM doctors worked with sports teams, only 45.8% knew that they served the general population. Fewer than half of respondents (43.7%) knew that SEM specialty training existed. 22.2% were considering pursuing SEM careers, but only one respondent expressed an interest in exercise medicine. Only 29.2% knew that there were SEM posts in the NHS, and 11.1% believed that SEM was an entirely independent-sector specialty. Most respondents (62.5%) achieved the recommended minimum weekly aerobic PA target, with similar rates among students (62.7%) and foundation doctors (61.5%). 83.3% indicated that their PA level was limited by study or work commitments. Respondents performed no better than chance at identifying the minimum weekly aerobic exercise target recommended in the UK guidelines (26.4% vs 20%, p=0.055). **Conclusions:** Although there is interest in SEM among medical students and foundation doctors, there is a lack of understanding of the role of SEM doctors and of the availability of SEM specialty training. This cohort was unfamiliar with PA guidelines and was slightly less physically active than the national average.

Introduction

Sport and exercise medicine (SEM) is a specialty that encompasses three main areas: musculoskeletal (MSK) medicine, exercise medicine and athlete/team care.[1, 2] SEM doctors can have diverse roles, from promoting physical activity (PA) among the general population to providing emergency care for elite sportspeople. Although the British Association of SEM (BASEM) was founded in 1952, it was only officially recognised as a specialty in the UK in 2005 and is smaller and less well understood than other specialties. In 2023, there were nine specialty training places and over 140 SEM Consultant posts within the National Health Service (NHS).[3, 4]

Insufficient education on SEM is a key barrier to its development as a specialty and its integration in the NHS.5 The role of SEM doctors is poorly understood, even among doctors working in specialties that intersect with SEM, such as GPs and orthopaedic surgeons.[6, 7] As a result, NHS SEM services are underutilised, and referral pathways may be unnecessarily prolonged.[6, 8]

PA reduces the risk of developing many common chronic disorders and is a relatively safe and inexpensive therapeutic tool.[9, 10, 11] The NHS Long Term Plan,[12] published in 2019, proposed that the demand for NHS services could be reduced by 'improving upstream prevention of avoidable illness and its exacerbations.' The subsequent Covid-19 pandemic underlined the importance of preventative medicine: obesity and chronic medical comorbidities conferred a higher risk of severe disease and mortality.[13, 14] However, doctors face a number of barriers to delivering PA advice to patients, including a lack of education on PA and unfamiliarity with PA guidelines.[15, 16] Moreover, physically active doctors feel more confident 'prescribing' PA to patients.[17,18] If PA is to be used as a preventative measure, it is critical that medical students and junior doctors are aware of national PA guidelines, and are supported to achieve the recommended PA targets themselves.

1 MBBS, IBSc. Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom.

2 Fourth-year Medical Student. King's College London GKT School of Medical Education, London, United Kingdom.

3 MBBS, MSc, IBSc. Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom.

4 MB ChB, BSc. Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom

About the Author: *1. Bonar graduated from King's College London GKT School of Medical Education (United Kingdom) with distinction in 2022. He gained an intercalated BSc in Sport and Exercise Medicine (London, United Kingdom) from Queen Mary University of London in 2020. He is currently working as a Foundation Year 2 doctor at St Thomas' Hospital in London. 2. Hassan is a 4th year Medical Student at King's College London, GKT School of Medical Education. He is set to graduate in 2025. 3. Harry graduated from Imperial College London Medical School (United Kingdom) in 2019, also gaining an Intercalated BSc in Global Health. He gained an MSc with distinction in Sports Medicine, Exercise and Health from UCL in 2022. He is currently completing GPVTS at Guy's and St Thomas' NHS Trust in London. 4. Ed graduated from Leicester Medical School (United Kingdom) in 2022 after gaining a degree in Biomedical Sciences in 2016 from Newcastle University. He is currently working as a Foundation Year 2 doctor at St Thomas' Hospital in London.*

Correspondence:

Bonar McGuire.

Address: Great Maze Pond, London SE1 9RT, United Kingdom

Email: bonar.mcguire2@nhs.net

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The primary aim of this project was to assess medical students' and foundation doctors' understanding of SEM as a specialty, and of how to pursue SEM careers. Secondary aims were to evaluate trainees' PA level and familiarity with national PA recommendations.

Methods

A STROBE checklist for observational studies was completed to ensure that all relevant items were included.

Participants: Medical students and foundation doctors of any grade were invited to complete an anonymized online survey between 28th October 2022 and 20th January 2024. No restrictions were placed on age, sex, or geographical location. Only medical students and foundation trainees were invited because more senior doctors are likely to have already begun specialty training programmes, which would have invalidated responses to questions about SEM training and careers. The survey was distributed to individuals by word-of-mouth and personal messages, and to larger groups via email. Because it was not possible to accurately determine how many invitations were received, a formal response rate was not calculated. Only one response per participant was allowed.

Questionnaire: An online questionnaire (available online as Supplementary material) was produced using Google Forms (Google Forms web application, Google, California, USA), consisting of four sections:

1) Awareness and interest in SEM (Questions 1-5)
2) Planning a career in SEM (Questions 6-9)
3) The role for SEM in the NHS (Questions 10-13)
4) PA among medical students and junior doctors (Questions 14-19)

At the start of the survey, participants were reminded that their responses would be anonymized. Section 2 only became accessible to respondents if they expressed an interest in pursuing a career in SEM, by answering 'yes' or 'maybe' to Question 5 in Section 1

Question 14, which assessed respondents' PA level, was updated on 19th November 2023, to enable comparison with the 2019 Chief Medical Officers' (CMO) PA guidelines.19 Categorical response options were changed from '0-1', '1-2', '2-3', '3-4', and '4+', to '0-0.5', '0.5-1.5', '1.5-2.5', '2.5-3.5', and '3.5+'. Respondents that selected '2.5-3.5' or '3.5+' were deemed to be meeting the weekly aerobic PA target.

The survey was closed to further responses once sufficient data had been collected for meaningful conclusions to be drawn, based on sample sizes used in related questionnaire-based studies.[6, 7, 20, 21] A survey response could not be submitted until all mandatory questions had been completed.

Statistical analysis: Raw data automatically populated a live online spreadsheet linked to the survey (Google Sheets web application, Google, California, USA). Data were manually reviewed by the authors once the survey had been closed. Duplicate responses were highlighted and removed before descriptive statistical analysis was performed. Chi-squared tests for statistically significant differences in frequency of categorical variables were performed where appropriate, using an α-significance level of $p < 0.05$.

Results

Respondents: After removing one duplicate response, there were 144 responses to the survey. Table 1 shows the number of respondents from each grade of training. The majority (72.2%) were medical students, with Year 3 students comprising the largest subgroup (24.3%). Foundation Year 3-5 doctors were the smallest subgroup (4.2%).

Table 1. Number of Responses by Stage of Training.

Year group	Total	% Total
Year 1 Student	8	5.6
Year 2 Student	9	6.3
Year 3 Student	35	24.3
Year 4 Student	34	23.6
Year 5 Student	18	12.5
Student total	**104**	**72.2**
Foundation Year 1	24	16.7
Foundation Year 2	10	6.9
Foundation Year 3/4/5	6	4.2
Foundation total	**40**	**27.8**
Total	**144**	**100.0**

Awareness and interest in SEM: Most respondents (87.5%) had heard of SEM. When asked which groups worked with SEM doctors, the most popular responses were 'sports teams' (98.6%) and 'elite athletes' (95.1%); the least selected responses were 'people without musculoskeletal injuries' (41.7%) and 'general population' (45.8%, ***Figure 1).***

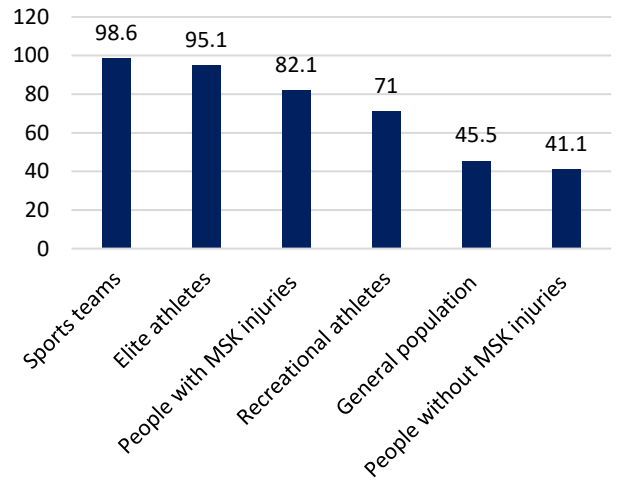
Fewer than half of respondents (43.7%) knew that there was a SEM specialty training programme. When asked if they were considering pursuing a career in SEM, 22.2% of respondents answered 'yes', 45.1% no', and 32.6% 'maybe'.

Planning a career in SEM: Of the 79 participants that expressed interest in pursuing a career in SEM, 13.9% were considering applying for SEM specialty training, 27.8% were not, and 58.2% were unsure. Among the 49 participants considering SEM specialty training, the most popular route was through GP training (46.9%), followed by Internal Medical Training (42.9%), then Acute Care Common Stem (30.6%).

Of the 30 respondents interested in careers in SEM, but not via SEM specialty training, 43.3% planned to train in orthopaedic surgery, and 16.7% intended to become GPs with a special interest in SEM.

Of the 24 respondents expressing an interest in a specific area within SEM, 20 (83.3%) wanted to work with sportspeople (amateur or professional), eight (33.3%) mentioned MSK medicine or rehabilitation, and only one mentioned PA promotion or exercise medicine ***(Figure 2).***

Figure 1. Responses to 'To your Knowledge, Which of the Following Groups do SEM doctors Work With?.



Legend: (Please tick all that apply). MSK, musculoskeletal.

The role for SEM in the NHS: Only 29.2% of respondents were aware that there are SEM posts in the NHS; 59.7% of respondents were unsure, and 11.1% thought that SEM was practised solely in the independent sector.

Most respondents (54.2%) thought that SEM should be provided by the NHS. The most commonly cited reason was to encourage PA among the general population to prevent chronic disease. Other reasons included: to reduce the number of patients with MSK problems presenting to GPs; to ensure access to care for those who cannot afford to use the independent sector; to provide specialised care for MSK injuries that do not require orthopaedics input.

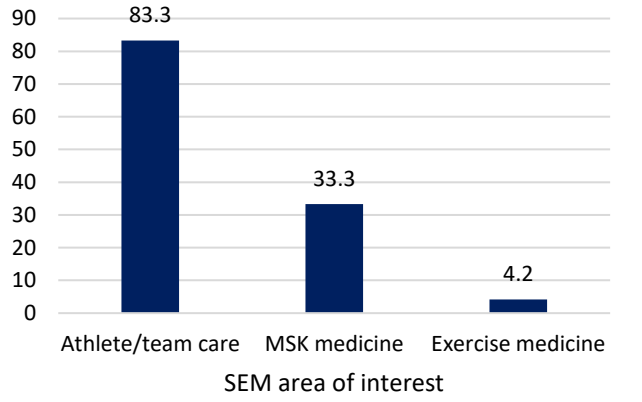
12.5% of respondents did not think that SEM should be provided by the NHS. Two broad reasons were given: 1) that SEM should be reserved for well-funded elite athletes and professional sports teams; 2) that other specialties already cover MSK and other sport/exercise-related conditions. ***(Table 2)*** shows a selection of these reasons.

PA among respondents: 62.5% of respondents met the recommended minimum weekly aerobic PA target (150 minutes of moderate-intensity activity). There was no significant difference in the proportion of medical students (62.7%) and foundation doctors (61.5%) achieving the target (χ^2 (1, n = 80) = 0.006, p = 0.94).

83.3% of respondents felt that their PA level was limited by their study or work commitments. Suggested ways to increase PA among doctors included: provision of on-site gym facilities; organised group exercise classes; longer breaks within shifts to allow doctors to exercise during the working day; protected time allocated to PA within rotas; subsidised exercise equipment and gym/sports club memberships; improved shower/changing facilities on site to encourage cycling/running to work; and standing desks.

Awareness of PA guidelines: Only 26.4% of respondents correctly identified the minimum weekly aerobic PA target recommended in the 2019 CMO guidelines ***(Table 3).*** The proportion of correct answers was no better than would be expected by chance, given that this was a multiple-choice question (MCQ) with five options (χ^2 (1, n = 144) = 3.67, p = 0.055). There was no significant difference in the proportion of correct responses made by medical students (26.0%) versus foundation doctors (27.5%) (χ^2 (1, n = 144) = 0.04, p = 0.85).

Figure 2. Responses to 'Which area(s) of SEM are you Most Interested in?.



Legend: (optional). MSK, musculoskeletal. SEM, Sport and exercise medicine.

A significantly higher proportion of respondents correctly identified the recommended minimum weekly target for strengthening exercise (twice per week) (56.3%) than for moderate-intensity aerobic exercise (26.4%) (χ^2 = 66.1 (1, n = 144), p < 0.0001). A greater proportion of medical students (59.6%) selected the correct response for the strengthening exercise target than foundation doctors (47.5%), but this difference was not significant (χ^2 = 1.72 (1, n = 144), p = 0.19).

Discussion

Understanding of SEM: Our key finding was that while most medical students and foundation doctors were aware of SEM as

a specialty, they did not fully understand the role of SEM doctors. Respondents generally misperceived SEM as a resource for elite sportspeople with MSK injuries, with fewer than half knowing that SEM doctors worked with the general population. The responses shown in ***(Table 2)*** further illustrate common misperceptions about the role of SEM doctors.

Table 2. Responses to the Question, 'Do you think SEM Should be Provided by the NHS (Funded by Taxpayers)? If not, Why?.

'...I don't think right now it would be acceptable to have taxpayers paying for the higher levels with elite athletes for example, considering the income they generate morally...'
'If its provided for athletes as a programme that doesn't benefit the general population I don't see why it should be non-private, unless it's like young athletes with disadvantageous backgrounds'
'Very specialised - is there a requirement for within the general population'
'I imagine the majority of the field focuses on high level sport / athletes rather than members of the general population with severe or debilitating illnesses'
'... SEM seems like a specialty reserved for only high level athletes...'
'It's for sports teams surely'
'Much of the injury treatment/rehab could be provided by a PT'
'Hard to tell usefulness to public in general and overlap with orthopaedics'
'What's space foes SEM fill that orthopaedics, physiotherapy and Endocrine not cover?'

SEM, Sport and Exercise Medicine; PT, physiotherapist.

Table 3. Responses to 'According to the UK CMO Physical Activity Guidelines for Adults, What is the Minimum Amount of Moderate-Intensity Activity One Should Engage in Per Week?.

Year Group	60 mins	90 mins	120 mins	150 mins	180 mins	Total	% Correct *
Medical students	10	22	39	27	6	104	26.0
Foundation doctors	3	12	11	11	3	40	27.5
Total	**13**	**34**	**50**	**38**	**9**	**144**	**26.4 ****

CMO, Chief Medical Officer
* correct answer is 150 minutes
** not significantly higher than would be expected by chance

It is important that all doctors understand SEM if NHS SEM services are to be utilised effectively. However, a limited understanding of SEM has previously been observed even among doctors working in roles that intersect with SEM, such as GPs and orthopaedic surgeons.[6, 7] This may explain why NHS SEM services are underutilised, with unnecessarily delayed referrals.[6, 8] For example, GPs are more likely to refer younger patients or those with sport-related injuries to SEM clinics than sedentary patients with chronic conditions.[6]

Interest and careers in SEM: Respondents showed limited awareness of SEM specialty training, and of how SEM has been integrated into the NHS. Fewer than half of our sample knew that there was a SEM specialty training programme, and fewer than a third knew that there were SEM posts in the NHS. Addressing this lack of awareness may increase the number of doctors working in SEM, and thus the number best equipped to engage in PA promotion. Encouragingly, more than half of respondents expressed some enthusiasm (either 'yes' or 'maybe') for pursuing a career in SEM. When asked for specific areas of interest within SEM, only one of 24 respondents mentioned exercise medicine or PA promotion, while 20 mentioned working with sportspeople. This suggests either a lack of awareness that SEM involves the use of PA as a therapeutic tool, or that our sample strongly preferred the other two branches of SEM (MSK medicine and athlete/team care).

Knowledge of PA guidelines: A striking finding was that most medical students and foundation trainees did not know the minimum amount of moderate-intensity aerobic activity recommended in the most recent UK CMO PA Guidelines. When asked to identify the correct amount in an MCQ with five options, they performed no better than chance ($p = 0.062$). Moreover, our survey is more likely to have been distributed to, and completed by, those interested in SEM, with an above-average interest in this area.

In 2016, 20% of GPs self-reported at least a broad awareness of the national PA guidelines[22] in 2020, a much higher proportion (61.3%) of Emergency Medicine (EM) doctors reported an awareness of the World Health Organisation's (WHO) recommended weekly PA level.[20] These studies evaluated awareness of PA guidelines using a categorical subjective scale of awareness[22] and 'yes/no' answers to the question, 'Are you aware of the... guidelines... ?,[20] respectively. In our study, participants were required to select the minimum recommended PA time in minutes, which provided a more rigorous test of their knowledge.

A 2012 survey of final year medical students in Scotland found that even among the 60% of participants that reported no awareness of the PA guidelines, 57% correctly identified the recommended weekly minimum PA in a five-option MCQ.[21] In our survey, 56.3% of respondents correctly identified the recommended weekly strengthening exercise target - a significantly higher proportion than the 26.4% that identified the moderate-intensity aerobic exercise target ($p < 0.0001$). In both cases, the high proportion of correct answers indicates that the MCQ was too easy to guess using common sense alone. To eliminate the confounding effect of guesswork, we suggest that future studies examine awareness of PA guidelines using free-text responses. For example, please state (in minutes) the minimum weekly amount of moderate-intensity PA recommended in the 2019 CMO guidelines.'

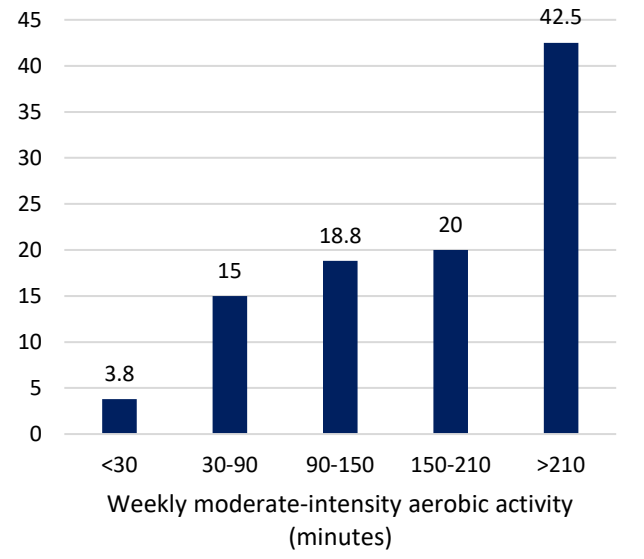
A limited awareness of PA guidance is perhaps unsurprising given that only 15 of 31 UK medical schools include the CMO PA guidelines in their curricula and five do not include any specific PA teaching.[15] Time spent teaching PA science and promotion during UK medical school education is minimal (4.2 hours) compared with that spent on teaching pharmacology (mean 109 hours; range 18 to 336 hours).[15] Aside from specific teaching on

PA, SEM-related topics are generally under-represented in undergraduate curricula.[23, 24] A lack of knowledge of PA guidelines and PA being an 'afterthought' are major barriers to doctors delivering PA advice.[16]

By comparison, integration of formal teaching on substance misuse into UK undergraduate curricula has been relatively extensive.[25] 97% of Scottish final year medical students correctly identified the maximum recommended weekly alcohol intake,[21] indicating that knowledge of guidelines related to health promotion can be improved by education. Promisingly, a Delphi SEM curriculum for undergraduates has recently been published, but has yet to be implemented.[24]

PA levels among respondents: 62.5% of respondents met the CMO's minimum weekly PA target ***(Figure 3).*** with no significant difference in PA levels between medical students and foundation doctors. This rate was slightly below the national average for adults in England (67.3%).[26] 77.3% of EM doctors in London achieve the minimum WHO-recommended aerobic PA target.[20] This difference might be because PA levels differ across medical and surgical specialties: 28% of EM respondents in Koch et al[20] considered their typical daily work to involve moderate-intensity PA, which was clearly defined in the questionnaire. By contrast, in 2008, Gupta and Fan[27] found that only 21% of doctors surveyed met the recommended minimum PA level, and that 64% of this cohort had met the target while at medical school. The most likely explanation for the discrepancy in results across these studies is that Gupta and Fan[27] assessed PA levels against the Department of Health (DH) target, which may be more difficult to achieve than the CMO target because it specifies a frequency (at least 5 times per week') as well as a duration of activity ('at least 30 minutes').

Figure 3. Respondents' self-Reported Weekly Moderate-intensity Aerobic PA Level. 62.5% of Respondents Achieved at least 150 Minutes per Week of Moderate-intensity Aerobic Activity, the Minimum Target Recommended in the 2019 CMO PA Guidelines.



Alarmingly, 83.3% of respondents felt that their PA levels were limited by study or work commitments. Similarly, shift patterns and lack of time were highlighted as the two commonest barriers to EM doctors achieving PA guidelines.[20] Doctors that achieve recommended PA targets themselves feel more confident prescribing PA to patients.[17, 18]Thus, work- or study-related barriers to PA for medical students and doctors should be addressed to facilitate PA promotion. 59 of our respondents proposed solutions to increase doctors' PA at work. The most frequent were allocating time in rotas specifically for exercise (47.5%), subsidising gym memberships and fitness equipment (30.5%), providing on-site gym facilities (27.1%), and organising group activities (27.1%). Although there was overlap, these differed in order of popularity from the suggestions of EM doctors, among whom the second commonest suggestion (52.1%) was to improve changing room facilities to encourage 'active transport' to and from hospital.[20]

Limitations: One limitation of this study is that the majority of the respondents were from London-based universities or hospitals, so it is unclear whether the results can be generalised to other parts of the UK. The survey is more likely to have been (1) distributed to and (2) completed by those with an interest in SEM. However, this potential selection bias only makes the lack of awareness of SEM and PA more surprising. To reduce the length of the survey, we did not assess participants' weekly vigorous-intensity PA or muscle strengthening activity levels; it is possible that the proportion of this population achieving these PA targets differs from that meeting the moderate-intensity PA target. Finally, because PA levels in our survey were self-reported, these are likely an overestimate of this population's true PA level.[28, 29]

Conclusion: Most medical students and foundation trainees do not fully understand the role of SEM doctors, and typically perceive SEM as an independent-sector specialty that caters for elite sportspeople. There is considerable interest in pursuing SEM careers, but a lack of awareness of SEM specialty training. SEM representatives and organisations may wish to prioritise education focused on SEM training and jobs, with an emphasis on SEM's exercise medicine component. This group is unfamiliar with national PA recommendations, suggesting that they receive insufficient teaching on PA. We recommend an increase in PA-related undergraduate and foundation education to empower doctors to engage in PA promotion. Respondents were less physically active than the general population. The majority felt that their PA levels were limited by work or study commitments. Employers should address work-related barriers to PA to maintain a healthy workforce and to facilitate PA promotion.

Summary – Accelerating Translation

Main problem to solve: Sport and Exercise Medicine (SEM) is a relatively new medical specialty, having only been officially recognised as such in 2005. SEM doctors can work in a range of roles, including injury prevention and rehabilitation, care of athletes of all levels, and physical activity (PA) promotion. However, previous research has shown that SEM services, which are available through the NHS, are underutilised because the role

of SEM doctors is poorly understood by other types of doctor (e.g., GPs). No previous study has assessed medical students' and foundation doctors' (those who have just graduated from university) understanding of SEM.

While PA is known to prevent many chronic conditions, doctors often struggle to discuss PA with patients due to a lack of education on PA and unfamiliarity with PA guidelines. Moreover, physically active doctors feel more confident 'prescribing' PA to patients. It is therefore crucial that medical students and junior doctors are aware of national PA guidelines and are supported to achieve the recommended PA targets themselves. No previous study has assessed foundation doctors' familiarity with national PA guidelines.

Aim of study:

1) To assess medical students' and foundation doctors' understanding of SEM as a specialty, and of how to pursue SEM careers.
2) To evaluate trainees' PA levels and familiarity with national PA recommendations.

Methodology: We distributed an anonymised online survey to medical students and foundation trainees between 28th October 2022 and 20th January 2024.

Results: 144 respondents completed the survey. 72.2% were students. 87.5% were already aware of SEM. While 98.6% knew that SEM doctors worked with sports teams, only 45.8% knew that they served the general population. Fewer than half of respondents (43.7%) knew that junior doctors could choose to complete specialty training in SEM. 22.2% were considering pursuing SEM careers, but only one respondent expressed an interest in promoting physical activity. Only 29.2% knew that there were jobs available for SEM doctors in the NHS, and 11.1% believed that SEM was an entirely independent-sector (private) specialty.

Most respondents (62.5%) achieved the national recommended weekly PA target (150 minutes of moderate-intensity activity per week), with similar rates among students (62.7%) and foundation doctors (61.5%). 83.3% felt that their PA level was limited by study or work commitments. Respondents performed no better than chance at identifying the minimum weekly PA target.

Conclusion: Medical students and foundation doctors demonstrated a limited understanding of the role of SEM doctors, and typically perceive SEM as an independent-sector specialty for elite athletes. Although respondents to our survey showed considerable interest in pursuing SEM careers, fewer than half were aware that SEM specialty training was available. Respondents were also unfamiliar with national recommendations on PA and were slightly less physically active than the general population. Most attributed their below-average activity levels to study and/or work commitments.

Our findings highlight the need to increase undergraduate and foundation education on training and careers in SEM, with an emphasis on roles involving PA promotion. Our results also suggest that medical students and foundation doctors require more teaching on PA, including discussion of national PA guidelines. Finally, employers may wish to address work-related barriers to PA to maintain a healthy workforce and to facilitate PA promotion.

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Original Article

A Cross Sectional Study on Adherence to Medication among Patients with Hypertension and/or Diabetes Attending One of the Tertiary Care Institutes of Ahmedabad City, Gujarat, India

Janak Patel,[1] Kanal Shah,[1] Jayveer Jain,[1] Venu Shah.[2]

Abstract

Background: The lifelong management of chronic diseases such as Hypertension and Diabetes Mellitus necessitates a comprehensive approach, including lifestyle modifications and consistent adherence to medication. Present study aimed to evaluate treatment adherence among patients with diabetes and /or hypertension attending a tertiary care institute in Ahmedabad city, India. **Methods:** A cross-sectional study was conducted among 200 patients aged over 18 years, diagnosed with diabetes and/or hypertension. The sample population was selected from a tertiary care institute at Ahmedabad city using a consecutive sampling method. Data collection utilized a pretested and predesigned proforma along with the Morisky Medication Adherence Scale (MMAS-8). **Results:** Hypertension was present in 43.0% of the participants, while 20.0% reported diabetes mellitus. Additionally, 37.0% had both conditions. Out of total 200 patients 53.5% exhibited low adherence to treatment. Lower adherence to treatment was found to be more among Diabetics (67.5%) as compared to hypertensive patients (51.2%). Among participants having comorbidities 48.6% had low adherence to treatment. The association between disease type and adherence levels was not significant (p-value = 0.305). Not having any symptoms and forgetfulness were common reasons for low adherence among 41.1% and 24.2% of participants, respectively. **Conclusion:** This study highlights the need for targeted interventions aimed at enhancing medication adherence among individuals managing with chronic illnesses like hypertension and diabetes. The findings provide valuable insights for healthcare professionals and policymakers to develop effective strategies for improving treatment adherence and subsequently mitigating the progression of these chronic conditions.

Introduction

Non-communicable diseases are on the brink of a surge in developing countries. India, already acknowledged as the "Diabetic capital of the world," is now progressing toward earning the title of the "Hypertension capital of the world" as well.[1] Lifelong treatment is mandatory in both the diseases to avert any complications. Adherence to antihypertensive as well as anti-diabetic treatment has a key role in effective management of the respective disease conditions. The World Health Organization (WHO) defined adherence as the extent to which a patient follows medical instructions.[2] In India, studies have reported rates of non-adherence to medication among the hypertensive and diabetic patients to be between 25 % and 85%.3-6 Factors affecting adherence to medication among hypertensive and diabetic patients were identified in previous studies which included type of drug regimen, duration of treatment as well as psychosocial factors.[7]

Despite the growing burden of diabetes and hypertension in India, there is a scarcity of comprehensive studies addressing adherence to treatment in the current study setting. Recognizing this research gap, the present study intended to assess medication adherence among patients with diabetes and hypertension attending one of the tertiary care hospitals in Ahmedabad city. It was also envisioned to find out the reasons behind low adherence to the treatment pertaining to diabetes and/or hypertension. This investigation is crucial for informing healthcare practices, enhancing treatment strategies, and ultimately improving the overall health outcomes of individuals grappling with these chronic conditions.

Methods

Cross-sectional study was conducted among patients attending Out patients Department of tertiary care teaching institute of Ahmedabad city of India. Study participants were patients already diagnosed with Hypertension and/or Diabetes taking treatment for more than 6 months.

Inclusion criteria: Any case of hypertension and/or diabetes more

[1] Third year Medical Student. GCS Medical College, Hospital & Research Center, Ahmedabad, India.

[2] MD Community Medicine. Professor, Community Medicine Department, GCS Medical College, Hospital & Research Center, Ahmedabad, India

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Correspondence:

Venu Shah

Address: Ahmedabad – 380025, Gujarat, India

Email: drvenushah@gmail.com

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than 18 years of age diagnosed with diabetes and/or hypertension for more than 6 months ready to give consent for the study.

Exclusion criteria: Patients with any psychiatric illness not able to respond to questionnaire and Diabetic patients taking insulin injections were excluded from the study.

Sample size was calculated using the formula 4 p q / l^2, where p is the adherence to treatment among diabetic patients as per previous study i.e.83.6% [8]absolute precision of 5.5%, power of 80%, at 95% confidence and 10 % of non response rate, the sample size calculated to 192, which was rounded up to 200.Using consecutive sampling, patients attending medical OPD of tertiary care during study period were interviewed till the sample size of 200 was achieved.

Personal interview of the study participants was conducted using pre-tested and pre-designed proforma. Main domains of the questionnaire include Socio demographic details, Medical history related to diabetes and / or hypertension, nature of treatment, personal history etc. Socioeconomic status was assessed using modified Prasad scale.[9]Adherence to treatment was determined by Morisky medication adherence scale MMAS-8.[10] In this scale, the first seven questions had binary response categories (yes/no) while the eighth item had a five-point Likert response. The scores of the MMAS-8 range from 0 to 8. A score below 6 indicates low adherence, a score between 6 < 8 medium adherence and a score of 8 high adherence. Previous study11 suggested that MMAS-8 had better psychometric properties, with sensitivity and specificity of 93% and 53% respectively and Cronbach's alpha value of 0.83.

Data was entered in Micro Soft Excel and analysed using Jamovi Software. The categorical variables expressed in frequency and percentages and the association between the two groups was calculated using Chi-square test. The quantitative variables were expressed as mean (standard deviation). A p-value of less than 0.05 was considered as statistically significant.

Results

The majority of the study participants falls within the age group of 46-60 years, comprising 46.5% of the study population. There was a near-equal distribution of gender, with females at 48.0% and males at 52.0%. The most common education level among study group was secondary (32.5%), followed by graduate (20.5%). A significant portion of the population was unemployed (56.0%) and belonged to joint families (56.0%). Maximum numbers of participants were from upper socio-economic class constituting 47.0% of the sample ***(Table 1).***

Among total participants, Hypertension was the most prevalent condition affecting 43.0% of the sample where as Diabetes mellitus was reported by 20.0% of individuals. Total 37.0% of the respondents were having with both hypertension and diabetes mellitus. A significant portion of study participants (52.0%) were diagnosed with above condition for more than 5 years. Approximately 19.5% each fall into the categories of 1-3 years, and 3-5 years since diagnosis. The majorities (72.0%) were taking less than 3 pills per day and only 5.5% took more than 5 pills daily. Out of pocket expenditure pertaining to medication expenses was assessed. It was found that 29.0% participants were spending between 200-400 INR on medicines while 27.0% had expense of more than 600 INR. Majority (83.5%) participants were adhered to regular follow-up visits as well as lifestyle modification after diagnosis of disease ***(Table 2)***.

Table 1. Demographic Profile of Study Participants (n=200).

Variables	n	%
Age Group (Years)		
18 - 30	4	2.0
31 - 45	27	13.5
46 - 60	93	46.5
61 - 75	65	32.5
More than 75	11	5.5
Gender		
Female	96	48.0
Male	104	52.0
Education		
Primary	31	15.5
Secondary	65	32.5
Higher secondary	36	18.0
Graduate	41	20.5
Post graduate	27	13.5
Occupation		
Employed	88	44.0
Unemployed	112	56.0
Type of family		
Joint	112	56.0
Nuclear	81	40.5
Three generations	7	3.5
Socio Economic Class		
Upper	94	47.0
Upper Middle	57	28.5
Middle	24	12.0
Lower Middle	13	6.5
Lower	12	6.0

Overall around 107 (53.5%) participants were having low adherence to treatment. For diabetes mellitus, a higher percentage of individuals exhibited low adherence (67.5%), with none reported high adherence. In the case of hypertension, low adherence was seen in 51.2% cases, while 3.5% had high

adherence to treatment. Individuals with both diabetes mellitus and hypertension had a balanced distribution (48.6% each) between low and medium adherence, with a smaller percentage showing high adherence (2.7%). The Chi-square test was applied to evaluate the association between disease type and adherence levels. However, it was not statistically significant (p-value = 0.305, ***Table 3)***.

Table 2. Profile Related to Disease and its Management Among Study Group (n=200).

Variables	n	%
Type of disease		
Hypertension	86	43.0
Diabetes mellitus	40	20.0
Both	74	37.0
Duration since diagnosis of disease		
Less than 1 year	18	9.0
1-3 year	39	19.5
3-5 year	39	19.5
More than 5 year	104	52.0
Number of pills per day		
Less than 3	144	72.0
3 to 5	45	22.5
More than 5	11	5.5
Expense incurred for purchase of medicine (INR)		
<200	44	22.0
200-400	58	29.0
400-600	44	22.0
>600	54	27.0
Regular Follow up visit		
Yes	167	83.5
No	33	16.5
Life style modification after diagnosis of disease		
Yes	167	83.5
No	33	16.5
Total	**200**	**100**

On assessment of possible reasons behind low adherence, it was found that a significant portion of individuals (41.1%) were not adhered to their treatment plan because they perceived no signs or symptoms, potentially underestimating the importance of continued medication. Forgetfulness was also a common reason for low adherence among 24.2% participants ***(Table 4)***.

Discussion

Current study evaluated the adherence to treatment among patients with Diabetes, Hypertension as well as patients having both of these comorbidities. Total 200 patients were interviewed using pretested proforma including morisky medication adherence scale. The study population predominantly comprised individuals aged 46-60 years (46.5%), with a balanced gender distribution (48.0% females, 52.0% males). Secondary education was the most common (32.5%), followed by graduate (20.5%), and majority belonged to joint families (56.0%). Hypertension affected 43.0%, diabetes mellitus 20.0%, and 37.0% had both conditions. A significant portion (52.0%) had been diagnosed for over 5 years. Most participants (72.0%) consumed less than 3 pills daily, with 29.0% spending 200-400 INR on medicines. The majority (83.5%) adhered to follow-up visits and lifestyle modifications.

Table 3. Adherence to Treatment Among Patients (n=200).

Disease	Adherence to Treatment			Chi square (p value)
	Low	Medium	High	
Diabetes mellitus (n=40)	27 (67.5 %)	13 (32.5 %)	0 (0.0 %)	4.83 (0.305)
Hypertension (n=86)	44(51.2 %)	39 (45.3 %)	3 (3.5 %)	
Both (n=74)	36 (48.6%)	36 (48.6 %)	2(2.7 %)	

Table 4. Reasons Mentioned by Participant for low Adherence to Treatment (n=107).

Reasons for low adherence*	n	%
No signs and symptoms	44	41.1
Forgetfulness	26	24.2
Non availability of medicine	22	20.5
High cost of medicines	19	17.7
Side effects	12	11.2

Patients diagnosed with Diabetes Mellitus, 67.5% demonstrated low adherence to treatment, while among those diagnosed with Hypertension, 51.2% exhibited low adherence. Those having both the illnesses, 48.6% had low adherence to treatment. In the study conducted by Balasubramanian et al among hypertensive patients of rural Kerala, 41.3% had high adherence, while the remaining 58.7% had either medium or low adherence.[12] Treatment adherence for hypertension was 82% in study conducted by Rao et al.[13] One of the meta-analysis conducted by Pokharel et al reported that half of the hypertensive population of Nepal were non-adherent to their anti-hypertensive medications.[14]

In current study, 67.5% of diabetic patients reported low adherence to treatment. Similar finding were observed in the study conducted by Sahoo et al with 65.8% of diabetic patients attending tertiary care hospital of Bhubaneswar, India with poor adherence to treatment.[15] Contrary to these findings Rao et al reported in their study that 83.6% diabetic patients were

compliant to treatment.[13] In current study hypertensive patients had better adherence to treatment as compared to Diabetic patients, whereas Sweileh et al noted that diabetic patients had better overall rate of compliance than hypertensive patients in their study.[16] Difference in adherence rates observed in various studies could be due to variation in the methods utilized for assessment of adherence. Although adherence levels varied for diabetes mellitus and hypertension, the association between disease type and adherence was not statistically significant in the current study (p-value = 0.305). It's important to note that while these statistics provide insights into the relationship between disease type and adherence, a non-significant result does not imply the absence of a relationship as it may be influenced by the sample size.

Current study evaluated the reasons behind low adherence among the study participants. Lack of symptoms perception (41.1%) and forgetfulness (24.2%) were the commonest reasons mentioned by the study cohort. Similar finding was present in the study conducted by Pokharel et al who mentioned forgetfulness, carelessness and cost of medications as the primary reasons for non-adherence to treatment.[14] Rao et al identified various factors contributing to low treatment adherence, with the most prevalent reasons including the cost of medications and the asymptomatic nature of the disease.[13] Lack of symptoms in the disease can impede the patient's motivation for treatment since there are no tangible benefits experienced by the patient.

The current study concluded that overall treatment adherence was low among the study population affecting with diabetes and/or hypertension. The study highlights the need for targeted interventions to address low adherence, considering factors such as perception and forgetfulness. This research contributes to the existing literature on adherence to medication in chronic diseases, offering a basis for future interventions and public health initiatives.

Summary – Accelerating Translation

A Cross Sectional Study was conducted on Adherence to Medication among Patients with Hypertension and/or Diabetes Attending One of the Tertiary Care Institutes of Ahmedabad City of India. Total 200 patients were interviewed in the study to identify level of adherence to treatment among them. Pretested and predesigned proforma including Morisky medication Adherence scale was used for data collection. It was observed that patients having Diabetes, Hypertension as well as patients with both of these conditions were having poor adherence to treatment with percentage of low adherence 67.5, 51.2 and 48.6%, respectively. On evaluating the reasons for low adherence it was found that patients were ignoring the disease condition due to absence of any symptoms. Forgetfulness in taking medications was also mentioned by one fourth of patients. The study highlights the need for targeted intervention towards increasing adherence to medication among patients with chronic illnesses like hypertension and diabetes.

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Original Article

Psychiatric Outcomes in Patients with Trigeminal Neuralgia Treated with Anticonvulsants and Antidepressants: A Retrospective Cohort Study Using a National Database

Ashley Deng,[1] Priya Kaneria,[1] Eduardo Espiridion.[2]

Abstract

Background: Trigeminal Neuralgia (TN) is a chronic craniofacial condition characterized by intense, sporadic shocks of pain through the trigeminal nerve. The unpredictable and severe nature of these episodes can be physically and mentally debilitating, significantly affecting the quality of life and often leading to anxiety, depression, and sleep disorders. This study investigated the psychiatric outcomes of anxiety, depression, and sleep disorders in TN patients who were treated with both anticonvulsants and antidepressants, compared to those who were treated only with anticonvulsants, to explore a multi-modal approach for addressing both pain and psychiatric symptoms. **Methods:** A retrospective analysis of electronic health records was conducted using TriNetX, a collaborative health network encompassing over 250 million patient records worldwide. The analysis included 15,129 patient records, comparing two cohorts of TN patients. **Results:** After adjusting for demographic factors, both cohorts were predominately female (73%), white (70%), and about 59 years of age. The results indicated that patients taking both anticonvulsants and antidepressants had higher risk, odds, and hazard ratios for developing depression (RR 10.448, OR 10.906, HR 10.763), anxiety (RR 2.680, OR 3.210, HR 3.013), and sleep disorders (RR 3.595, OR 3.696, HR 3.697) compared to those taking only anticonvulsants. **Conclusion:** Despite limitations including inability to assess dosage and severity of pain, these findings suggest that concurrent use of anticonvulsants and antidepressants may exacerbate psychiatric symptoms in TN patients. However, these effects might improve with appropriate dosage adjustments, highlighting the need for including dosage adjustments and monitoring.

Introduction

Craniofacial pain and disease encompass a range of conditions affecting the head, face, and neck, such as temporomandibular join (TMJ) disorders, headaches, and facial pain. Among these, chronic forms like Trigeminal Neuralgia (TN) present significant clinical challenges due to their debilitating nature, marked by intense, electric-shock-like facial pain.[1] The pain severely impacts quality of life, both physically and mentally.[2]

The pathophysiology of TN includes classical (primary), secondary, and idiopathic causes. Classical TN often arises from trigeminal nerve root compression, typically by the superior cerebellar artery, leading to demyelination and heightened nerve excitability.[3,4] These changes disrupt voltage-gated sodium channel (VGSC) conductance, resulting in the abnormal nerve activity that underpins TN's hallmark sharp pain.[3] Secondary TN stems from identifiable conditions like multiple sclerosis or brain tumors. Idiopathic TN lacks a clear etiology, highlighting the need for further research into unexplained cases.

The diverse causes of TN, ranging from nerve compression to idiopathic cases, underscore the complexity of managing this condition. These variations not only influence the severity of pain but also contribute to the high prevalence of psychiatric and sleep-related comorbidities in affected individuals. Recognizing this interplay, the treatment options outlined in this study focus on pharmacological strategies aimed at alleviating TN symptoms while addressing its primary comorbidities—anxiety, depression, and sleep disorders.

The American Academy of Neurology (AAN) and the European Federation of Neurological Societies (EFNS) recommends anticonvulsants, such as carbamazepine and oxcarbazepine, as first-line treatments for classical TN. These drugs alleviate neuropathic pain by stabilizing electrical activity in the nervous system through mechanisms such as blocking voltage-gated sodium channels (VGSCs), modulating calcium channels, and balancing excitatory and inhibitory neurotransmitters.[2] While

[1] B.S. Second-year Medical Student. Drexel University College of Medicine, West Reading, USA.

[2] MD. Reading Tower Health Hospital, Reading, USA.

About the Author: *Ashley Deng and Priya Kaneria are second-year medical students at Drexel University College of Medicine in West Reading, USA. Ashley is a Medical Student Summer Research Fellow and Co-Chair of DUCOM's largest student run service organization, Health Outreach Project. Priya is passionate about investigating quality of life outcomes across diverse fields, including cardiology and psychiatry. Her research focuses on understanding how clinical interventions impact patient-centered outcomes, using real-world data to drive meaningful insights.*

Correspondence:

Ashley Deng

Address:50 Innovation Way-Wyomissing, PA 19610- USA

Email: asd328@drexel.edu.

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commonly used in epilepsy, these mechanisms are effective in reducing abnormal nerve excitability in TN.

Although antidepressants are sometimes added to manage TN-related comorbidities like depression and anxiety, no clinical trials have directly examined the efficacy of combining anticonvulsants and antidepressants for TN. Existing literature typically focuses on either drug class alone.[6-7] However, evidence from psychiatric treatments suggests that combining these medications may have synergistic benefits. For instance, the combination of lamotrigine (an anticonvulsant) and antidepressants has shown promising results in treating bipolar disorder, suggesting potential relevance for TN treatment.[8] Nonetheless, studies often lack dosage-specific analyses or considerations for the complex interplay between pharmacological treatments and comorbidities such as sleep disorders. The potential for combined pharmacological therapies is particularly relevant given the high prevalence of psychological comorbidities in TN, such as depression, anxiety, and sleep disorders.

Comorbidities

Anxiety & Depression: Chronic pain of TN exacerbates psychological consequences including depression and anxiety. A nationwide retrospective cohort study found that individuals with TN are three times more likely to experience clinical have depression and anxiety compared to controls.[5] In fact, patients with TN demonstrated higher levels of these conditions compared to those with atypical face pain.[9]

Physicians may prescribe antidepressants in addition to anticonvulsants to counter mood changes in regard to anxiety and depression. Notably, depressive disorders and mania are rarely seen as complications of treatment in patients given carbamazepine alone due to its chemically similar component to tricyclic antidepressants.[10] However, it is still uncertain if incorporating antidepressants in conjunction with anticonvulsants would further reduce anxiety and depression stemming from social or physiological consequences.

Sleep Disorders: Sleep disorders represent a prevalent and impactful comorbidity in individuals suffering from TN. The interplay between TN and sleep disturbances is complex, often resulting in a bidirectional relationship that exacerbates the symptoms of both conditions.

Individuals with TN frequently experience disturbances in sleep patterns. [11]The intensity and frequency of TN pain episodes, characterized by sudden, electric shocks on one side of the face, can disrupt sleep continuity and quality. In a study assessing quality of life in 298 patients diagnosed with TN, a construct validity analysis revealed a correlation between deteriorating sleep, energy, and appetite.[12] If sleep disturbances are prolonged among individuals with TN, heightened depression and anxiety could be a likely occurrence.[13]

Relating to TN treatment, anticonvulsants can either have no effect or an improved effect on sleep. For first line pharmacological treatments such as carbamazepine, sleep is not notably affected with patients with epilepsy. However, oxcarbazepine has shown as either worsening or having no effect for patients with epilepsy.[11] There is inconclusive evidence of the performance of anticonvulsants on enhancing sleep with patients with TN. Antidepressants, commonly prescribed to manage mood disorders associated with chronic pain, can influence sleep architecture. While these medications may be effective in addressing depression and anxiety in TN patients, they can have adverse effects on rapid eye movement (REM) sleep, potentially worsening sleep disorders. In fact, it was shown that most antidepressants suppress REM in both healthy and depressed patients.[14]

TN is a complex condition with varied manifestations, including psychological and sleep-related symptoms. Insights into the efficacy of combined pharmacological interventions can guide treatment plans, offering clinicians evidence-based tools to tailor therapeutic approaches to individual patient needs. The study aims to evaluate the efficacy of anticonvulsant drugs in the treatment TN and to explore the benefits of adding antidepressants to the treatment regimen through the impact on the psychiatric symptoms anxiety, depression, and sleep disorders. The study hypothesizes that combining anticonvulsants and antidepressants will lead to improved psychiatric outcomes and better management of psychological and sleep-related symptoms in TN patients.

Methods

Data set: This study utilized a retrospective cohort design to examine the long-term psychiatric outcomes in patients diagnosed with Trigeminal Neuralgia (TN) and treated with anticonvulsants, with or without antidepressants. Data were obtained from the TriNetX Collaborative Network, which includes de-identified electronic health records from 61 U.S.-based healthcare organizations over a 20-year period. Two cohorts were established based on treatment regimens, and psychiatric outcomes were assessed over a 5-year follow-up period post-diagnosis. Propensity score matching was applied to minimize confounding variables, ensuring comparable baseline characteristics across cohorts. Statistical analyses included risk ratios, odds ratios, and hazard ratios, accounting for time-to-event outcomes using the Cox proportional hazards model.

Study Population: The study was run using only the United States Collaborative Network in the TriNetX database. This included 61 Health Care Organizations (HCOs). All patients included in the study were diagnosed with Trigeminal Neuralgia (ICD-10 CM: G50). A time constraint of 5 years after the first day of diagnosis was used. We believe this period is sufficient to capture potential chronic psychiatric effects of TN and the ongoing impact of anticonvulsant and antidepressant treatment. Additionally, only patients diagnosed within the last 20 years were included. This is because TriNetX is most comprehensive

following the wide-spread implementation of EPIC electronic health record around 2006. Cohort 1 was defined as patients diagnosed with TN (ICD-10 CM: G50) and prescribed anticonvulsants medication (VA: CN400) and antidepressant medication (ATC: N06A). Cohort 2 was defined as patients diagnosed with TN (ICD-10 CM: G50) and prescribed anticonvulsants medication (VA: CN400) without antidepressant medication (ATC: N06A).

Exclusion criteria were designed to reduce confounding effects from pre-existing psychiatric conditions that independently influence the likelihood of developing chronic psychiatric sequelae. Specifically, patients with bipolar disorder (ICD-10 CM: F31), depressive episode (ICD-10 CM: F32), or persistent mood affective disorders (ICD-10 CM: F34) were excluded. These conditions were chosen due to their established and direct associations with anxiety, depression, and sleep disorders, which were primary outcomes of interest. While these exclusions aimed to isolate the psychiatric effects specifically attributable to TN and its treatment, other psychiatric comorbidities or chronic illnesses were not excluded due to low prevalence in the dataset, as determined during cohort analysis. However, the absence of exclusions for other conditions like chronic pain, personality disorders, or substance use disorders could introduce residual confounding. Additionally, socioeconomic status could not be assessed. Although propensity score matching addressed demographic and some clinical factors (e.g., age, sex, race, and ethnicity), the inability to control for additional variables, such as chronic illnesses or pain severity, due to data limitations (e.g., lack of natural language processing) may limit the generalizability of the findings.

The psychiatric outcomes that were assessed were a diagnosis of 'Major depressive disorder, recurrent (ICD-10 CM:F33)', 'Anxiety, dissociative, stress-related, somatoform and other non-psychotic mental disorders (ICD-10 CM:F40-F48)', and 'Sleep disorders not due to a substance or known physiological condition (ICD-10 CM:F51).' Acute depressive episodes were not included in the outcome analysis as the study was aimed to observe long-term outcomes ***(Figure 1).***

Statistical Analysis: Measures of association and survival were assessed using the TriNetX platform. Patients diagnosed with the studied outcomes prior to the indexed event were excluded. Risk ratio (RR), which compares the probability of achieving a defined outcome between two cohorts, was extrapolated as well as odds ratio (OR), the probability of an event occurring divided by the probability of the event not occurring was also compared between cohorts. RR was particularly relevant due to the binary nature of the outcomes of interest (yes/no). OR was necessary for comparing more rare conditions. Hazard ratios (HR), which calculate how quickly an outcomes occurs over time, were calculated using the Cox Proportional hazards model. The Cox model directly estimates the HR. HR is particularly valuable for its ability to incorporate time as a factor, clarifying differences in the speed of outcome occurrence. By leveraging the Cox proportional hazards model alongside RR and OR calculations, the study ensured a comprehensive analysis of both the association and timing of psychiatric outcomes in relation to treatment regimens.

Results

Cohort 1 included TN patients treated with both anticonvulsants and antidepressants, while Cohort 2 included those treated with anticonvulsants alone. Patients with pre-existing conditions such as bipolar disorder, depressive episodes, or persistent mood disorders were excluded to avoid confounding factors. Both cohorts were propensity score-matched on variables like sex, age, race, and ethnicity. The central symbol indicated effect size (RR, OR, HR) with the horizontal line representing 95% confidence intervals. An effect size greater than 1 suggests increased association of the outcome ***(Figure 1).***

Our study initiated with 15,238 TN patients on a combined regimen of anticonvulsants and antidepressants, alongside 23,408 TN patients exclusively on anticonvulsants. After a 1:1 Propensity Score Match, each cohort comprised 15,129 patients. Post-matching, both cohorts showed a balanced profile: mean age of 59 years, 73% female representation, 71% non-Hispanic or Latino, and 70% white ***(Table 1).***

After matching for age, sex, race, and ethnicity, risk ratio and odds ratio were calculated. Results indicate that patients with TN taking anticonvulsants and antidepressants had a higher risk and odds for development of depression, anxiety, and sleep disorders than their counterparts taking only anticonvulsants. Depression shows a particularly high increase in risk (RR= 10.448) when taking anticonvulsants and antidepressants concurrently rather than taking anticonvulsants alone ***(Table 2).***

Similarly, patients with TN taking both anticonvulsants and antidepressants demonstrated a markedly higher hazard ratio in depression, anxiety, and sleep disorder development compared to their counterparts only taking anticonvulsant. Based off the Cox proportional hazards model, larger chi-square values generally indicate stronger evidence of an association between the medication and the outcome. The chi-square and the p-value indicate whether the medication had a significant impact on the determined outcomes. A p-value <0.05 is generally significant. For depression and anxiety, the larger chi-square value ($\chi 2$= 6.276, 36.777 respectively) compounded with their corresponding p-value (p-value = 0.01, <0.01 respectively) indicate that combination anticonvulsant and antidepressant therapy show statistically significant impact on time to development of depression and anxiety ***(Table 3).***

Finally, we created a summary figure that shows the comparative OR, RR, and HR of depression, anxiety, and sleep disorder when comparing cohort 1, TN patients taking concurrent anticonvulsants and antidepressants, and cohort 2, patients only taking anticonvulsants. Notably, all associated risks were over the value of 1, with depression being the most at-risk outcome ***(Figure 2).***

Table 1. Characteristics of Study Population Prior to and After Propensity Match.

Variables	Before Matching			After Matching		
	AC+AD (n=15,238)	AC (n= 23,408), Control	p-value	AC+AD (N = 15,129)	AC (n = 15,129, control)	p-value
Age at index date +/- SD	58.8 +/- 16.9	61.6 +/- 16.9	<0.001	59.0 +/- 16.7	59.0 +/- 16.9	0.665
Gender						
Female	11119 (73.0%)	15122 (64.6%)	<0.001	11010 (72.8%)	11018 (72.8%)	0.918
Male	3644 (23.9%)	7380 (31.5%)	<0.001	3644 (24.1%)	3646 (24.1%)	0.979
Ethnicity						
Hispanic or Latino	1053 (6.9%)	1959 (8.4%)	<0.001	1053 (7.0%)	1028 (6.8%)	0.570
Not Hispanic or Latino	10914 (71.6%)	15882 (67.8%)	<0.001	10810 (71.5%)	10796 (71.4%)	0.859
Unknown Ethnicity	3271 (21.5%)	5567 (23.8%)	<0.001	3266 (21.6%)	3305 (21.8%)	0.587
Race						
White	10936 (71.8%)	15767 (67.4%)	<0.001	10832 (71.6%)	10811 (71.5%)	0.770
Black or African American	1526 (10.0%)	2628 (11.2%)	<0.001	1526 (10.1%)	1608 (10.6%)	0.122
Asian	316	870	<0.001	316	322	0.810
American Indian or Alaska Native	55	72	0.370	55	40	0.123
Native Hawaiian or Other Pacific Islander	19	58	0.039	19	10	0.095

Legend: *AC=anticonvulsant AD=antidepressant*

Figure 1. Selection Criteria for Retrospective Cohort Study.

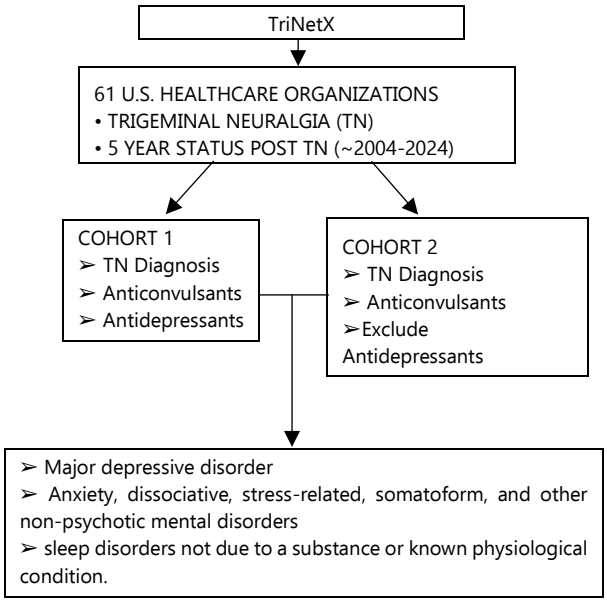
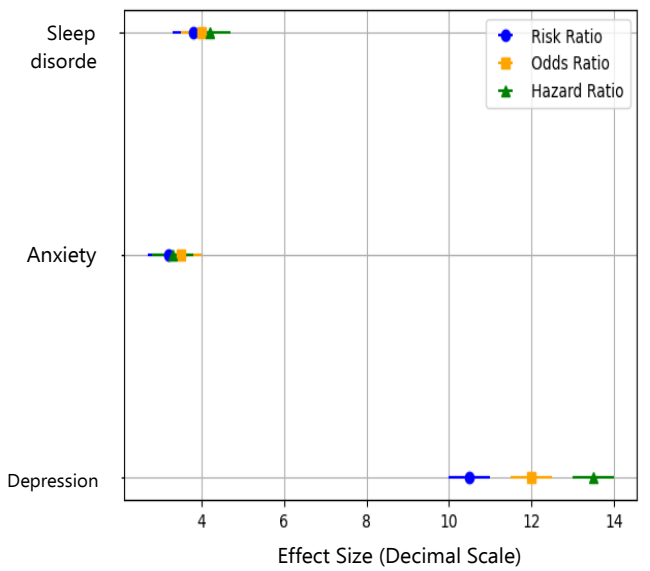


Figure 2. Summary Forest Plot of RR, OR, and HR for Depression, Anxiety, and Sleep Disorder Outcomes.



Discussion

Our study examined the relationship between antidepressant use in conjunction with anticonvulsants and its impact on observed psychiatric symptoms. Utilizing RR, OR, and HR analyses, our findings provide comprehensive insights into the potential implications of this treatment approach across different mental health conditions. In chronic depression, patients undergoing antidepressant and anticonvulsant therapy demonstrated a risk ratio of 10.448, revealing an over tenfold increased risk compared to the comparison cohort. This extremely high RR could be due to unaccounted comorbidities or mediation side effects. However, exclusion of patients with pre-existing mood disorders (such as bipolar disorder or depressive episodes) was designed to minimize confounding by these conditions. However, the decision to exclude only these specific conditions and not others could be too narrow, potentially missing other underlying mental health disorders that predispose patients to depression. This relationship should be further investigated. For generalized anxiety, the risk ratio stood at 2.680, indicating a nearly threefold higher risk in the exposed group. Sleep disorders exhibited a risk ratio of 3.595, emphasizing a more than threefold elevated risk in patients receiving this combined treatment. By examining hazard ratios, our study revealed that combined anticonvulsant and antidepressant therapy versus only anticonvulsant therapy only had a significant impact on time to development of anxiety and depression. The chi-squared and p-value for sleep disorders was not significant. These findings collectively suggest a potential lack of benefit in improving psychiatric symptoms with antidepressant use alongside anticonvulsants, prompting careful consideration by clinicians in treatment decisions for this patient population. The consistency across RR, OR, and HR for each outcome reinforces the reliability of these findings

Chronic pain is heavily associated with increased risk for psychiatric symptoms. Trigeminal nerve branch afferents (V1,V2,V3) convey sensation from the face and mouth to the trigeminal ganglion located in Meckel's cave in the temporal bone. From there, the neurons travel to the lateral pons of the brain stem where they synapse with the second order neuron that ascends to the thalamus.

The enter/exit point on the lateral pons is often the site of nerve compression, potentially by the superior cerebellar artery. The second order neuron projects to the somatosensory cortex and limbic structures including the amygdala, hypothalamus, and anterior cingulate gyrus.[15] Similarly, limbic structure activity modulation has been implicated in depression and anxiety. Furthermore, thalamus and hypothalamus receive projections from the reticular activating system, causing arousal. Stimulation of these areas can lead to hyperarousal and interrupted sleep structure. In addition to the anatomical overlap in structure, there is a convergence of neurotransmitters between pain and psychiatric symptoms, with serotonin and norepinephrine playing pivotal roles.[16] Our findings substantiate the fundamental connection between psychiatric symptoms and pain, echoing the intricate interplay of neuroanatomy and neurotransmitter pathways.

Table 2. Risk Ratio and Odds Ratio of Psychiatric Outcomes of Patients Taking Concurrent Anticonvulsants and Antidepressants Versus Anticonvulsants Only.

Outcome	Risk Ratio	95% CI	Odds Ratio	95% CI
Depression	**10.448**	(8.14, 13.41)	**10.906**	(8.478,14.027)
Anxiety	**2.68**	(2.528, 2.840	**3.21**	(3.002, 3.433)
Sleep disorder	**3.595**	(3.018,4.282)	**3.696**	(3.094, 4.415)

Table 3. Hazard ratio of psychiatric outcomes of Patients Taking Concurrent Anticonvulsants and Antidepressants Versus Anticonvulsants Only.

Outcome	Hazard Ratio	95% CI	χ^2	df	p
Depression	**10.763**	(8.376, 13.831)	6.276	1	0.01
Anxiety	**3.013**	(2.831, 3.208	36.777	1	<0.01
Sleep Disorder	**3.697**	(3.099,4.41)	0.021	1	0.88

Anatomical and chemical overlap contributes to the reciprocal relationship between pain and psychiatric symptoms, meaning patients with chronic pain often will develop psychiatric symptoms which can then exacerbate pain. In fact, 30-45% of patients with chronic pain experience depression.[17] Anticonvulsants, mainly carbamazepine, are a first line defense for treating TN pain. Carbamazepine acts by stabilizing electrical activity in the brain, mainly through decreasing Na+ channel conductance. Carbamazepine, along with other anticonvulsants, have been associated with improving pain symptoms in TN patients.[18] However, they may be associated with increasing prevalence of depression as they work to decrease excitation of neurons by increasing inhibitory neurotransmitter release or decreasing excitatory conductance or neurotransmitter.[19] Depression is often listed as a side effect for many anticonvulsants drugs. It is not unreasonable to expect providers to prescribe antidepressants to address these symptoms. Antidepressants work through increasing mood-enhancing monoamine neurotransmitters, mainly serotonin and norepinephrine, through selective reuptake inhibition. However, a common side effect of antidepressants is insomnia through the increase in wakefulness neurotransmitters serotonin and norepinephrine

Several recent studies have found combination therapy to be effective in managing chronic pain or neuralgia. A systemic review in 2022 that evaluated the efficacy, tolerability, and safety of different combination therapies for neuropathic pain found that pregabalin and tricyclic antidepressant, imipramine, therapy reduced pain by more than 50% in patients. [20] Another systemic

review focused on nonopioid drug therapy for cancer pain found that antidepressant duloxetine with opioid and pregabalin was more effective in reducing pain than only opioid and pregabalin alone.[21]

We hypothesize that several reasons could explain the increased association of psychiatric side effects with combination therapy. Interaction between antidepressants and anticonvulsants are complicated and may influence the pharmacokinetics and pharmacodynamics of each other. Pharmacokinetically, carbamazepine can act through enzyme induction to accelerate drug metabolizing enzymes.[19] This can reduce the efficacy of any other drug introduced into the system. Pharmacodynamically, carbamazepine can also cause hyponatremia.[22] This can be exacerbated by antidepressants, which have also been shown to cause hyponatremia.[23] Hyponatremia has been associated with psychiatric symptomatology and cognitive impairment.[24] There have been several case reports of patients presenting with depressive symptoms who were later observed to have serum sodium concentrations below normal 130 mEq/L. 25 Additionally, carbamazepine has been used as a mood stabilizer and in treatment of bipolar disorder, where addition of antidepressant may cause mood swings.[26]

Another hypothesis is serotonin syndrome. A significant pharmacological concern in the management of TN with combined anticonvulsant and antidepressant therapy is the potential for serotonin syndrome, a condition arising from excessive serotonergic activity in the central nervous system and peripheral tissues. Serotonin syndrome can occur when the introduction of certain anticonvulsants, which may increase extracellular serotonin release, is compounded by selective serotonin reuptake inhibitors (SSRIs) or serotonin-norepinephrine reuptake inhibitors (SNRIs). SSRIs and SNRIs enhance serotonin levels by inhibiting its reuptake, leading to increased serotonin availability at synaptic junctions. The mechanism of serotonin syndrome also involves peripheral and central receptors, such as 5-HT2A and 5-HT1A, where overstimulation can result in autonomic dysregulation. Serotonin syndrome is associated with positive psychiatric symptoms including anxiety and insomnia.[27] Recent studies have shown that even mild cases of serotonin syndrome can manifest as anxiety and sleep disturbances, through inhibition of excitatory neurotransmission. This can modulate wakefulness and affective behavior, aligning with our findings.[28] The interaction between anticonvulsants and antidepressants, when not carefully managed, has the potential to exacerbate psychiatric symptoms.

The findings of our study, which suggest increased psychiatric risk with concurrent anticonvulsant and antidepressant treatment in trigeminal neuralgia (TN), should be viewed within the context of existing literature. While our study highlights significant risk ratios, especially for depression and anxiety, some research critiques the generalized association between these drug classes and psychiatric outcomes. For instance, anticonvulsants like carbamazepine and oxcarbazepine, while essential in TN management, are known to have mood-stabilizer properties that, in certain cases, could offset the risk of depressive symptoms when used appropriately.[29] The lack of dose specificity in our study could contribute to the stronger observed associations between combined treatment and adverse psychiatric outcomes.

Additionally, there is a significant variability in how patients respond to anticonvulsants and antidepressants due to genetic differences.[30] Polymorphisms in genes encoding P450 enzymes can significantly influence drug metabolism. Poor metabolizers may experience higher drug toxicity, increasing risk of psychiatric symptoms, while rapid metabolizers may clear the drugs too quickly, reducing their therapeutic efficacy. Moreover, stress has been shown to disrupt the normal functioning of CYP enzymes, potentially exacerbating these metabolic variations[30]. Furthermore, variations in serotonin transporter genes such as 5-HTTLPR can affect antidepressant efficacy and increase risk of serotonin syndrome[28]. Our study did not account for these genetic polymorphisms or environmental factors like stress, which may have introduced variability in the psychiatric outcomes observed. Future studies should aim to account for these variables, particularly by exploring the impact of individualized dosing strategies, pharmacogenetic testing, and environmental factors such as stress on psychiatric outcomes in patients receiving concurrent anticonvulsant and antidepressant therapy.

To our knowledge, this is the first and largest study to retrospectively study the psychiatric effect of antidepressants on TN patients using anticonvulsants. Due to the rarity of the disease, retrospective cohort review was necessary to compile adequate amounts of data per cohort. The study ultimately was able to compile 15,129 patients per cohort. Some limitations we encountered are generalizability and possible additional confounders. Due to the TriNetX platform, we were limited to the 61 Health care organizations that have opted to be a part of the platform in the U.S. Though ICD-10 codes is the standard in the U.S, there can be variability between providers on diagnostic coding. Additionally, though we matched cohorts for age, ethnicity, and sex, there may be additional confounders that we did not include such as chronic illnesses and pain severity. We did exclude the potential co-morbidities of bipolar disorder, depressive episode, and persistent mood affective disorders. TriNetX is developing their natural language processing ability which will benefit future studies in assessing continuous variables and psychiatric diagnoses that are assessed on specific scales and noted in the health record. We also did not account for dosages of medications. The appropriate balance between anticonvulsants and antidepressants may be particularly influential on reducing psychiatric symptoms. Due to the nature of a retrospective study, we cannot establish causality. Future long term follow up studies would be valuable in assessing effects over time.

Our study provides invaluable insights into a rare medical condition. This large-scale cohort analysis highlights the complexities of TN treatment, suggesting that while anticonvulsants are essential for pain management, the addition of antidepressants may exacerbate psychiatric symptoms in some patients. Clinicians should adopt a multi-modal approach

addressing both pain and psychiatric comorbidities. While anticonvulsants remain the primary treatment for managing pain, the addition of antidepressants may introduce risks that could potentially worsen psychiatric outcomes in certain patients.

To enhance patient care, clinicians should consider regular psychiatric monitoring for TN patients, especially those on combination therapies involving anticonvulsants and antidepressants. This could involve periodic mental health evaluations, structured screening for depression, anxiety, and sleep disorders, and timely adjustments to therapy as needed. Implementing these steps may help mitigate adverse psychiatric outcomes and allow for tailored treatment based on the patient's evolving needs.

Future studies should explore additional factors that may influence treatment outcomes, such as the impact of different dosages, specific antidepressant classes, and potential benefits of pharmacogenetic testing. This research could help clarify whether certain TN patients may be predisposed to psychiatric symptoms under specific treatment combinations. Prospective or controlled studies focusing on these variables could provide more precise guidance on optimizing therapy for TN patients with complex psychiatric profiles.

Summary – Accelerating Translation

We present Psychiatric Outcomes in Patients with Trigeminal Neuralgia Treated with Anticonvulsants and Antidepressants: A Retrospective Cohort Study Using a National Database. Trigeminal Neuralgia (TN) is a debilitating condition characterized by sudden and intense facial pain, often described as shock-like. Beyond the physical toll, many TN patients struggle with mental health issues, such as anxiety, depression, and sleep disorders, which can further diminish their quality of life. Standard treatment for TN typically involves anticonvulsant medications to manage pain. However, some patients are also prescribed antidepressants to address coexisting psychiatric symptoms. While this combined approach might seem beneficial, it remains unclear how these medications interact and whether they improve or worsen mental health outcomes.

This study aimed to explore the impact of combining anticonvulsants and antidepressants on psychiatric outcomes in TN patients by comparing those treated with both medications to those treated only with anticonvulsants. Using TriNetX, a global database containing over 250 million patient records, researchers conducted a retrospective analysis of 15,129 TN patients. These patients were divided into two groups: one group received only anticonvulsant medications, while the other was treated with both anticonvulsants and antidepressants. The analysis examined the risk (relative risk, RR), odds (odds ratio, OR), and hazard ratios (HR) of developing anxiety, depression, and sleep disorders in each group, accounting for demographic factors such as age, gender, and race. The results showed that most patients in both groups were women (73%), white (70%), and around 59 years old. Patients who were treated with both anticonvulsants and antidepressants had a significantly higher likelihood of developing psychiatric conditions compared to those on anticonvulsants alone. Specifically, this group showed much higher risks of depression (RR: 10.448, OR: 10.906, HR: 10.763), anxiety (RR: 2.680, OR: 3.210, HR: 3.013), and sleep disorders (RR: 3.595, OR: 3.696, HR: 3.697). These findings suggest that combining anticonvulsants and antidepressants may exacerbate psychiatric symptoms in TN patients rather than alleviate them. While this may seem counterintuitive, the results underscore the complexity of managing TN and its associated mental health challenges. It is possible that these outcomes could improve with more precise medication dosages and close monitoring of patients. This highlights the importance of personalized treatment plans and the need for further research to optimize the management of both pain and mental health in TN patients

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Author Contributions

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Original Article

Pediatric Hepatoblastoma: A Single-Institution Case Series

Jessica Sawaya,[1] Joyce McRae,[1] Georgi D. Mladenov,[2] Andrei Radulescu.[3]

Abstract

Introduction: Hepatoblastomas comprise up to two-thirds of malignant liver masses in childhood and rank as the third most common malignant neoplasm in children under the age of three. Treatment and prognosis are highly dependent on tumor staging and characteristics. Our study's aim is to analyze the clinical findings and outcomes of hepatoblastoma at our institution. **Methods:** After Institutional Review Board (IRB) approval was granted from Loma Linda University #5240020, we conducted a retrospective review on all patients under the age of 18 with a diagnosis of hepatoblastoma between February 2000 to January 2022. Variables assessed included demographics, work up, surgical intervention, recurrence, and mortality. **Results:** Fifteen patients were diagnosed with hepatoblastoma within that timeframe. Mean age was 18.7 months. Associated comorbidities included three patients with prematurity, one patient with Beckwith-Wiedemann Syndrome, and two unique presentations each of Prune Belly Syndrome and grade IV/V vesicoureteral reflux. There were four mortalities, two due to relapse in disease, one due to pulmonary and CNS metastasis at diagnosis, and another due to sepsis and multi-organ failure. Eleven patients continued monitoring without tumor recurrence. All patients were treated based on the Children's Oncology Group (COG) guidelines. **Conclusion:** Risk stratification is an important component of hepatoblastoma management. Our cohort demonstrated novel comorbidities of Prune Belly Syndrome and vesicoureteral reflux. Eleven patients received neoadjuvant chemotherapy that allowed for subsequent surgical resection. Our mortalities were associated with tumor metastasis and recurrence consistent with elevated alpha-fetoprotein (AFP) values. Future research should involve multi-institutional studies focusing on comorbidities and genetic analysis.

Introduction

Hepatoblastoma is the most common primary hepatic malignant tumor in children and is the third most common malignant neoplasm in those under three years of age following neuroblastoma and nephroblastoma, respectively.[1,2] They account for up to 60% of malignant liver masses in childhood and 1% of all pediatric cancers with the highest incidence in those below the age of four.[1-3] The incidence in males is approximately 1.5 times higher than in females.[2,4,5] Nevertheless, hepatoblastoma remains a rare malignancy with an incidence in the United States of 10.5, 5.2, and 0.1 cases per 1 million children in the age groups of younger than one year, one to four years, and five to nine years, respectively.[3] Certain factors, including low birth weight (<1500 grams), exposure to the neonatal intensive care unit (NICU), Beckwith-Wiedemann Syndrome, Familial adenomatous polyposis (FAP), Trisomy 18, and maternal or paternal smoking prior to conception are associated with the development of hepatoblastoma .[3,5,6]

In most cases, hepatoblastoma has no presenting symptoms other than a palpable mass in the right upper abdominal quadrant.[2,6-8] Symptoms such as nausea, vomiting, weight loss, and weakness begin to occur at more advanced disease states as the enlarging tumor begins to compress nearby organs.[4,6,7] Serum AFP is elevated in 80 to 90% of patients and can be used as a marker for treatment response and relapse.[3,7-9] Patients whose AFP level is below 100 ng/mL are considered to have poor prognosis.[3,7,8]

Treatment and prognosis are highly dependent on tumor staging and characteristics, including resectability, metastasis, response to chemotherapy, and histological component. A staging system defined by the International Childhood Liver Tumors Strategy Group (SIOPEL) called Pre-treatment extent of disease (PRETEXT) evaluates the extent of disease based on these factors and is beneficial for treatment planning.[1,6,9] The Children's Oncology Group (COG) stratifies treatment based on very low-risk, low risk, intermediate risk, and high-risk tumors requiring either primary resection alone, primary resection with either adjuvant therapy, neoadjuvant therapy or both, or liver transplant.[10] Due to advances in imaging modalities, surgical management, liver transplant, and chemotherapy protocols, overall survival has increased from thirty to seventy percent over the past three decades.[1,2,7,11]

[1] Third-year Medical Student. Loma Linda University School of Medicine, Loma Linda, CA, USA.

[2] MD. Division of Pediatric Surgery, Department of Surgery, Loma Linda University Children's Hospital, Loma Linda, CA, USA.

[3] MD, PhD. Division of Pediatric Surgery, Department of Surgery, Loma Linda University Children's Hospital, Loma Linda, CA, USA.

About the Author: *Jessica Sawaya is currently a third-year medical student of Loma Linda University School of Medicine, CA, USA. She has recently published an article regarding gun violence in pediatric patients and is interested in pursuing a career in Cardiothoracic Surgery.*

Correspondence:
Jessica Sawaya
Address: Loma Linda University School of Medicine 11175 CA 92350, USA
Email: ARadulescu@llu.edu

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Given the rarity of this condition, we conducted a retrospective study on pediatric patients at our hospital with a diagnosis of hepatoblastoma to analyze patterns in clinical findings, treatment, and overall outcomes. Due to the smaller sample of patients, it was determined that a case series was best suited for this study's design.

Methods

All patients under the age of 18 who presented to Loma Linda University Children's Hospital between the years of 2000 and 2022 with a diagnosis of hepatoblastoma were included in this retrospective case series (IRB approval #5240020). Cases were abstracted from an internal database. Each case was evaluated via the electronic medical record including review of radiological studies, operative reports, and histopathological results. Variables assessed included patient demographics (date of birth, age, sex, race, ethnicity, weight, height, BMI), primary diagnosis, tumor stage and location (using the PRETEXT system), lab values (including AFP), comorbidities, chemotherapeutic and surgical treatment, surgical events, tumor histopathology, relapse, and mortality. This case series has been reported in line with the PROCESS Guideline.[16]

Results

A total of 15 patients were included in the study ranging from three months to four years of age with a mean age of 18.7 months ***(Table 1).*** Ten patients were male. Twelve patients were born at full term, with three patients born premature and four patients spending time in the NICU, one for pneumothorax and the other for a respiratory infection. Congenital conditions were present in seven patients including Prune Belly Syndrome (2), Beckwith-Wiedemann Syndrome (1), polyuric renal failure (1), bilateral grade IV vesicoureteral reflux, left sided grade V vesicoureteral reflux (2), cryptorchidism (1), and midgut malrotation (1). With regards to mass location, seven cases were in the right lobe of the liver, six cases in the left lobe of the liver, and two cases spanned both the right and left lobes. All patients presented with elevated AFP values, ranging between 1,210 and 1,248,500 ng/mL with an average of 303,294.2 ng/mL. Diagnosis of a liver mass was made via Computed Topography (CT) scan of the abdomen and pelvis and definitive diagnosis of hepatoblastoma was confirmed with biopsy ***(Figure 1).*** At the time of diagnosis, three patients demonstrated pulmonary metastasis with one patient having additional metastasis to the brain ***(Table 1).***

Eleven patients underwent planned neoadjuvant chemotherapy following tumor biopsy due to initial tumor characteristics not being amenable to surgical resection ***(Table 2).*** [Neoadjuvant chemotherapy here is defined as chemotherapy administered prior to surgical intervention with the goal of shrinking the tumor.] Seven patients were enrolled in the AHEP0731 protocol consisting of cisplatin (CDDP) alone (2), cisplatin, 5-fluoruracil, and vincristine (C5V) (1), cisplatin, 5-fluoruracil, vincristine, and doxorubicin (C5VD) (2), vincristine, irinotecan, and temsirolimus (1), or carboplatin with doxorubicin alternating with vincristine (1) depending on risk stratification and Tumor Board discretion. Four patients underwent tumor resection, and two patients had liver transplants. One patient who had pulmonary metastasis at the time of initial diagnosis had a thoracotomy with resection of metastatic pulmonary nodules prior to hepatectomy. Following surgery, these patients received postoperative chemotherapy, including C5V (1), CDDP (1), and C5VD (2). Within the group of patients enrolled in the AHEP0731 protocol, two patients ultimately died, one due to progression of pulmonary and CNS metastasis who was unable to undergo surgery secondary to severe thrombocytopenia and the other due to complications from tumor recurrence following neoadjuvant chemotherapy, tumor resection, and postoperative chemotherapy.

Of the four patients who were not enrolled in the AHEP0731 protocol, two received C5V, one received cisplatin, vincristine, and amifostine, and one received only cisplatin and amifostine. Two of these patients underwent tumor resection and received postoperative chemotherapy with C5V and amifostine. The remaining two patients only underwent liver biopsy, and both received post-procedural chemotherapy, one with C5V and amifostine and the other with CDDP. The latter patient died due to multi-organ failure and sepsis secondary to pneumonia.

Four patients were treated primarily with surgical management. All four patients underwent tumor resection or hepatectomy and three patients received postoperative chemotherapy with C5V and amifostine (2) and C5VD (1). One patient who received postoperative chemotherapy died due to tumor recurrence with pulmonary metastasis.

In terms of histologic patterns determined via liver biopsy or tumor resection, six patients were found to have mixed fetal embryonic pattern, three had a pure fetal pattern, one had a pure embryonal pattern, one had a macrotrabecular pattern, one had a mixed epithelial-mesenchymal pattern, and three patients' subtype were unavailable from retrospective chart review. No mortalities or tumor recurrences occurred in patients with the pure fetal histology. Two mortalities occurred in a patient with mixed fetal embryonal pattern. Tumor recurrence and mortality occurred in one patient with macrotrabecular and one patient with mixed epithelial-mesenchymal pattern.

Patients were followed on average for nine years following diagnosis, with a range of two years from most recent diagnosis in 2022 up to 19 years. For those that underwent surgical management, there were no reported intraoperative or immediate postoperative complications. Except for the four mortalities, the remaining eleven patients had no reports of tumor recurrence.

Discussion

Hepatoblastoma can occur in children of any age. However, it most commonly presents in children between six months and three years of age, with a mean age of diagnosis at 16 months

Table 1. Summary of Reported Cases.

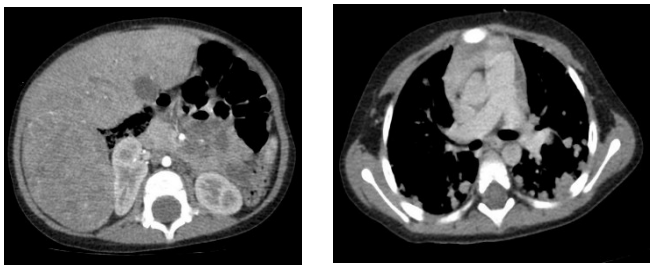
Case No.	Age	Sex	Comorbidities	Diagnosis	Metastasis at Diagnosis	Recurrence
1	3 mos	Female	None	Mixed fetal/embryonal hepatoblastoma	None	None
2	2 y	Female	None	Unspecified Hepatoblastoma	None	None
3	2 y	Female	Beckwith-Wiedemann Syndrome, Bilateral Sensorineural Hearing Loss	Macrotrabecular Hepatoblastoma	None	Yes, Pulmonary. Deceased
4	4 y	Female	Fetal Alcohol Syndrome, Developmental Delay, Bilateral Grade IV Vesicoureteral Reflux	Mixed epithelial/mesenchymal hepatoblastoma	None	Yes. Deceased
5	4 y	Female	None	Fetal hepatoblastoma	None	None
6	4 mos	Male	None	Mixed fetal/embryonal hepatoblastoma	None	None
7	8 mos	Male	None	Unspecified Hepatoblastoma	None	None
8	11 mos	Male	Premature (36 weeks) with NICU Stay, Prune Belly Syndrome, Chronic Kidney Disease	Fetal hepatoblastoma	None	None
9	11 mos	Male	None	Mixed fetal/embryonal hepatoblastoma	Pulmonary	None
10	11 mos	Male	None	Unspecified Hepatoblastoma	None	None
11	13 mos	Male	Prune Belly Syndrome, Left Grade V Vesicoureteral Reflux, Polyuric Renal Failure, Cryptorchidism, Midgut Malrotation	Embryonal hepatoblastoma	None	None
12	13 mos	Male	Premature (36 weeks) with NICU Stay	Fetal hepatoblastoma	None	None
13	15 mos	Male	NICU Stay for Pneumothorax at Birth	Mixed fetal/embryonal hepatoblastoma	Pulmonary	None
14	2 y	Male	Premature (32 weeks) with NICU Stay, Reactive Airway Disease	Mixed fetal/embryonal hepatoblastoma	None	Deceased
15	2 y	Male	None	Mixed fetal/embryonal hepatoblastoma	Pulmonary, Brain	Deceased

and rarely develops in children over five years.[1,3,7] If hepatoblastoma does present in those over five years of age, prognosis is typically poor in comparison to those less than one year of age.[3,8,11] In our cohort of 15 patients, the mean age of diagnosis was 18.7 months, with a range between three months and four years, consistent with the literature. Three of a total of four mortalities occurred in children trending toward the older extreme of our age range at two, three, and four years of age.

Many factors have been reported to be associated with hepatoblastoma including low birth weight, male gender, Neonatal Intensive Care Unit (NICU) exposure, preeclampsia, polyhydramnios and oligohydramnios, high maternal pre-pregnancy weight, treatment for infertility, and maternal or paternal smoking prior to conception.[3,5,6] Certain conditions also present with higher incidence in those with hepatoblastoma in comparison to the general United States population, such as Familial Adenomatous Polyposis (FAP), Beckwith-Wiedemann

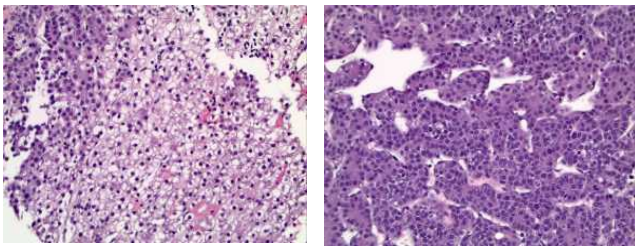
Syndrome, and Trisomy 18.[3,5,6] Our patients' comorbidities are consistent with previously published associations including NICU exposure due to prematurity, respiratory disease, and Beckwith-Wiedemann Syndrome.[3,5,6] Conditions not commonly found in the literature that were present in our patients include two cases of Prune Belly Syndrome, one of which was associated with left grade V vesicoureteral reflux, and one case of polyuric renal failure, bilateral grade IV vesicoureteral reflux, cryptorchidism, and midgut malrotation. Both Prune Belly Syndrome and vesicoureteral reflux are congenital anomalies of the kidney and urinary tract (CAKUT). Hepatoblastoma has been found in association with hypodysplastic glomerulocystic kidney, renal agenesis, and dysplastic kidney in prior case reports.[12-15] A common genetic alteration present within 70-80% of hepatoblastoma cases include upregulation of the Wnt/β-catenin pathway, which is also responsible for renal development.[16, 17] Therefore, hepatoblastoma may have a common underlying genetic mechanism with CAKUT.[18]

Figure 1. Case 15.



Legend: (A) Computed tomography (CT) of the abdomen and pelvis demonstrating a large hepatoblastoma measuring 16.2 cm x 9.9 cm x 9.7 cm in the right lobe of the liver and smaller lesion in the left liver lobe at 2.5 cm. (B) CT chest showing multiple soft tissue nodules throughout bilateral lungs, measuring up to 1.4 cm in diameter, later found to be metastasis. Given extensive pulmonary and CNS metastasis at the time of diagnosis, patient was unable to undergo surgical management and ultimately died secondary to the significant disease burden.

Figure 2. Case 6.

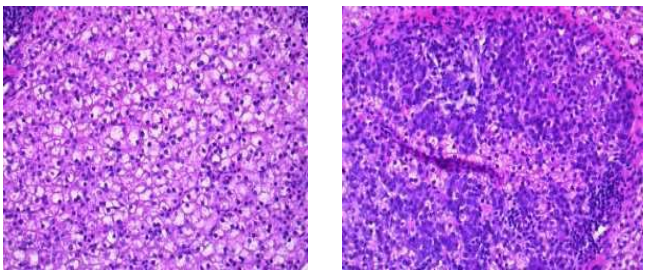


Legend: (A) Preoperative biopsy pathology demonstrating fetal epithelial pattern. (B) Preoperative biopsy pathology demonstrating embryonal component.

Most cases of hepatoblastoma are asymptomatic, with the main presenting factor being a palpable mass in the right upper quadrant. Five of our patients presented with a palpable abdominal mass or abdominal distension, with only four patients who presented with symptoms of abdominal pain. About one fifth of the cases presented with extrahepatic disease at the time of diagnosis.[11] Metastasis of hepatoblastoma primarily travels to the lungs which may present with symptoms of difficulty breathing, cough, and hemoptysis.[7] Metastasis at diagnosis indicates a poor prognosis.[3,19] Three patients presented with pulmonary metastasis at the time of diagnosis. Two of these patients were successfully treated with either resection of the pulmonary nodules and chemotherapy or chemotherapy alone. The other died from progression of the effects of his metastatic disease.

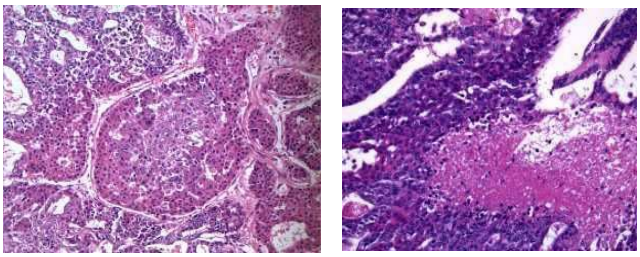
Imaging studies such as ultrasound, Magnetic Resonance Imaging (MRI), CT with intravenous contrast, angiography, or liver scintigraphy can aid in determination of tumor location, segmental extension or proximity to hepatic vessels.[1,7,8] The gold standard for diagnosis of hepatoblastoma is tumor biopsy.[1,6,7] All of our patients were preliminarily assessed with an abdominal and pelvic CT scan and definitive diagnosis was made with image-guided or open tru-cut liver biopsy.

Figure 3. Case 12.



Legend: (A) Preoperative biopsy pathology demonstrating hepatoblastoma with sheets and cords of tumor cells resembling fetal hepatocytes. (B) Preoperative biopsy pathology demonstrating adjacent area of tumor with a more primitive appearance of the tumor cells which is associated with a more favorable prognosis.

Figure 4. Case 3.



Legend: (A) Surgical pathology demonstrating macrotrabecular growth pattern with broad islands of neoplastic hepatocytes. (B) Surgical pathology demonstrating central necrosis within an area of microtrabecular growth. This is a rare subtype of hepatoblastoma with histologic findings similar to hepatocellular carcinoma. This patient ultimately died secondary to tumor recurrence with pulmonary metastasis.

A common treatment course for hepatoblastoma includes both pre- and postoperative chemotherapy and tumor resection with partial liver resection or liver transplant if the former is not feasible.[7] Complete resection of the tumor can be curative, however, only 50% of patients have tumors that can be resected at the time of diagnosis.[1,11,19] In our cohort, only four patients were treated with upfront surgical intervention. Neoadjuvant chemotherapy reduces tumor size allowing up to 87% of patients

to be eligible for complete surgical resection.[1,2,11,19] Resection was possible for four of our patients after neoadjuvant treatment. Postoperative chemotherapy further decreases the risk of tumor relapse and addresses any postoperative tumor residual.[2] From our study, eleven patients had postoperative chemotherapy after Tumor Board discussion. In the case of lung metastases,

Table 2. Summary of Treatment Interventions.

Case No.	Pre-operative or Initial Chemotherapy	Surgical Intervention	Postoperative or Definitive Chemotherapy	Outcome
1	None	Right hepatic lobectomy	C5V + Amifostine	Alive
2	Vincristine + Cisplatin + Amifostine	Exploratory Laparotomy with Resection	C5V + Amifostine	Alive
3	None	Hepatectomy	C5VD	Deceased
4*	C5V	Resection of hepatoblastoma	C5V	Deceased
5*	CDDP	Liver transplant	CDDP	Alive
6*	CDDP	Right extended hepatectomy	None	Alive
7	Cisplatin + Amifostine	None	C5V + Amifostine	Alive
8	None	Partial liver resection	C5V + Amifostine	Alive
9	C5V	Resection of hepatoblastoma	C5V + Amifostine	Alive
10*	Carboplatin + Doxorubicin + Vincristine	Liver Transplant	None	Alive
11	None	Resection of hepatoblastoma	None	Alive
12*	C5VD	Resection of hepatoblastoma	C5VD	Alive
13*	C5VD	Partial hepatectomy, small bowel and omentum excision, thoracotomy with resection of pulmonary nodules	C5VD	Alive
14	C5V	None	CDDP	Deceased
15*	Vincristine + Irinotecan + Temsirilimus	None	None	Deceased

Legend: denotes AHEP0731 Protocol C5V=cisplatin, 5-fluoruracil, vincristine; CDDP=cisplatin; C5VD= cisplatin, 5-fluoruracil, vincristine, doxorubicin

neoadjuvant chemotherapy may be used to achieve remission, however, surgical resection is required if the tumors persist.[7] One of our patients underwent a thoracotomy for pulmonary metastasectomy. Liver transplant is preferred for cases in which the tumor cannot be completely resected due to vascular involvement, in tumors that are unresponsive to chemotherapy, or with multifocal tumors.[1,9,10] Two of our patients had liver transplant in combination with chemotherapy due to unresectable tumors and no tumor recurrence or mortality at 4 and 8 year follow-up, respectively.

Histopathological subtypes serve as major prognostic considerations for pediatric liver tumors.[8] Many histological types exist for hepatoblastoma including epithelial, mesenchymal, mixed epithelial and mesenchymal, and undifferentiated. Epithelial types can further be divided into embryonal, fetal, pleomorphic, anaplastic, small cell, undifferentiated, and cholangioblastic macrotrabecular subtypes.[6] Fetal epithelial hepatoblastoma is made up of cells that resemble fetal hepatoblasts during embryonic development and generally has a more favorable prognosis.[11,19] Embryonal epithelial hepatoblastoma resembles the liver at 6-8 weeks of gestation and is the most common presenting pattern.[18] Uncommon histological patterns include cholangioblastic macrotrabecular epithelial and mixed epithelial-mesenchymal hepatoblastoma.[14] The former displays a macrotrabecular growth pattern akin to hepatocellular carcinoma and accounts for only about 5% of all cases.[18] Mixed epithelial-mesenchymal hepatoblastoma contains mesenchymal components including fibroblastic stroma, muscle, osteoid, and cartilage.[11] Consistent with the literature, most of our patients (40%) presented with a mixed fetal embryonic pattern ***(Figure 2),*** 20% had pure fetal histology ***(Figure 3),*** 6.7% had a pure embryonal histology, 6.7% had macrotrabecular hepatoblastoma ***(Figure 4),*** 6.7% demonstrated a mixed epithelial-mesenchymal pattern, and 20% did not have a histology pattern available upon retrospective review. There was no recurrence or mortality in all patients with hepatoblastoma of pure fetal histology. Two mortalities occurred with mixed fetal embryonic pattern with one due to progression of metastasis at the time of diagnosis and the other due to multi-organ failure and sepsis. The other two mortalities occurred in the macrotrabecular and mixed-epithelial-mesenchymal pattern due to recurrence after initial treatment. A cohort study conducted at a neighboring institution demonstrated similar findings with fetal and epithelial subtypes associated with increased overall survivability and lowest risk of relapse or death with pure fetal subtypes.[21]

Following treatment, patients diagnosed with hepatoblastoma are monitored for up to five years. AFP values are monitored as elevations could potentially indicate residual tumor or tumor relapse, which is a major cause of mortality among patients following treatment.[2,7] All patients in our cohort who achieved remission following treatment had normalization in AFP values, and the two with relapse demonstrated elevation in AFP levels (168,430 ng/mL and 1,422 ng/mL). In a recent study by Srinivasan et. al., they noted poor prognosis in patients with tumor relapse. There was a six percent survival to 36 months in those with refractory or relapsed disease. In addition, they found that a decline in AFP of more than 90% was associated with improved

three-year survival. [22] Therefore, monitoring of AFP values is an important diagnostic clue to disease recurrence.

While this study presents a sizable number of a rare condition, our sample size is not large enough to allow for significant statistical analysis. Given the retrospective nature of this study, some data is missing from older cases and the reasoning behind treatment decisions was not always clear. Future studies should be directed towards compiling a larger cohort of patients into a multi-institutional study with a specific focus on genetic analysis of hepatoblastoma and associated comorbidities.

Summary – Accelerating Translation

Hepatoblastoma is a rare malignancy of the liver that presents most commonly in children under the age of three. Current treatment is highly dependent on tumor staging and characteristics and consists of chemotherapy, surgical management, or a combination of both based on individual risk category. The purpose of our study is to analyze the clinical findings, treatment, and outcomes of pediatric hepatoblastoma at a single free-standing children's hospital.

We conducted a retrospective review of all patients under the age of 18 with a diagnosis of hepatoblastoma between the years of 2000 to 2022. We assessed patient demographics, work up, surgical intervention, recurrence, and mortality.

A total of fifteen patients were found to have a diagnosis of hepatoblastoma within the designated time frame with a mean age of 18.7 months at diagnosis. Our results demonstrated presentations of known associated comorbidities including that of prematurity (3), Beckwith-Wiedemann Syndrome (1), and neonatal intensive care unit stay (4) as well as unique conditions including Prune Belly Syndrome (2) and vesicoureteral reflux (2), otherwise not documented in the literature. All patients presented with elevated alpha-fetoprotein (AFP) values at diagnosis with an average level of 303,294.2 ng/mL.

Three patients were treated with chemotherapy alone, two of which died, one secondary to pulmonary and brain metastasis at the time of diagnosis and the other due to sepsis and multi-organ failure. One patient was treated with only surgical management and three patients were treated with surgical intervention followed by postoperative chemotherapy, one of whom died due to tumor recurrence and pulmonary metastasis. Eight patients underwent neoadjuvant chemotherapy administered prior to surgical intervention with the primary goal of shrinking the tumor and six of these patients also received postoperative chemotherapy, one of which died due to tumor recurrence.

Six patients had histologic presentations of mixed fetal embryonic pattern, three had a pure fetal pattern, one had a pure embryonal pattern, one had a macrotrabecular pattern, one had a mixed epithelial-mesenchymal pattern, and three patients' subtype was unavailable from retrospective chart review. Two mortalities occurred in the mixed fetal embryonal pattern group and both patients with the macrotrabecular and mixed epithelial-mesenchymal pattern had tumor recurrence and mortality.

Categorizing a patient's tumor stage and risk is an important component of hepatoblastoma management for appropriate treatment. The unique comorbid conditions in our cohort, including Prune Belly Syndrome and vesicoureteral reflux, fall into the category of congenital anomalies of the kidney and urinary tract (CAKUT), proposing a possible common underlying genetic mechanism with hepatoblastoma. Our cohort demonstrated that neoadjuvant chemotherapy allows for excision of initially unresectable tumors with good, long-term disease-free outcomes. Our mortalities were associated with tumor metastasis, tumor recurrence, and certain histological factors which may serve as poor prognostic factors. Both of our tumor recurrences presented with elevated AFP values, therefore, long term monitoring of this marker is critical in the patient's post-treatment care plan. Future research can include larger cohort of patients in a multi-institutional study with specific focus on genetic analysis of hepatoblastoma and associated comorbidities.

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Short Communication

Development and Evaluation of a Pilot Short-Term Mental Health Curriculum with Longitudinal Evaluation for Minority Youth

Robin C. Granberry,[1] Vivek Mathesh,[2] Lauren Ford,[1] Wesley Thompson,[2] Hilda Loria,[1] Thomas K. Pak.[3]

Abstract

Background: Minority youth are susceptible to mental health issues in the United States. Early intervention with a mental health curriculum is valuable in building resilience and wellness. Our study's purpose was to design, implement and evaluate a mental health curriculum (Mental Health Matters) for minority youth in a local community center. **Methods:** We conducted a needs assessment of mental health topics important for minority youth. Pre-and post-lesson surveys were administered at each session to measure students' knowledge and understanding of lesson objectives. We analyzed paired data using a Wilcoxon signed-rank test. **Results:** The needs assessment identified a need for educating youth about emotional insight and regulation and interpersonal communication. From the needs assessment, we worked with a local community organization to design a short-term longitudinal mental health curriculum. With the same local community organization, we implemented the curriculum to an after-school program for minority youth. The pre- and post-survey showed the students gained a significant increase of perceived confidence: fundamentals of mental health ($p=0.008$); stress response, box breathing, and perceiving stress ($p=0.046$); coping skills ($p=0.025$); communication styles/conflict resolution strategies ($p=0.031$). Qualitative feedback from students and administrators indicated strengths of the curriculum included its adaptability and applicability to students' lives. **Conclusion:** Overall, we successfully developed a pilot mental health curriculum based on a community needs assessment for minority youth.

Introduction

Mental illness is a public health issue in adolescence with suicide as the second leading cause of death in adolescents in America[1]. Studies suggest that one of the most effective methods to address mental health of youth may be to incorporate social interventions in lieu of cognitive or medicinal therapy[2]; and more effective in cases where culturally appropriate treatment can be provided[2]. This is particularly important for racial and ethnic minorities which are less likely to have access to mental health services and more likely to have a severe mental disorder[3]. For instance, one review found that racial/ethnic minority youth were more likely to face barriers to mental health care, including lack of insurance, transportation, as well as cultural stigma surrounding mental health[4]. Immigrant youth similarly face barriers of low insurance rates, language/technological barriers, and discrimination leading to lower usage of mental health services despite equal or greater need[5].

Social interventions to address mental health in youth can be implemented through Community-Academic partnerships. These partnerships not only provide education about mental health, but also help to decrease barriers to care and facilitate navigation of complex social, educational, and healthcare systems[6]. Existing programs such as Brighter Bites, a school-health program being implemented in six cities around the country, as well as mental health curricula utilizing pre-existing infrastructure found in schools, have shown that these partnerships can be very successful[7].

Given that schools are an integral part of youths' lives and of the community, schools make ideal partners to enact a mental health program. Since school attendance is mandatory until ages 16-18 years old in the United States, a school-based setting for a mental health program can reduce barriers, like the need for transportation, the need to search for available resources, and need for insurance[5]. Additionally, several studies have already shown that in countries outside the US[8] school mental health programs have impact on high school students, including "improvements in adolescent mental health knowledge, support seeking, and well-being"[9].

Our paper delves into a collaborative effort between an academic institution and community organization to improve the mental health of minority youth by developing and evaluating a longitudinal mental health curriculum.

[1] MD. University of Texas Southwestern Medical Center, Dallas, TX, USA.

[2] Second-year medical student. University of Texas Southwestern Medical Center, Dallas, TX, USA.

[3] MD, PhD. University of Texas Southwestern Medical Center, Dallas, TX, USA

About the Author: *Robin C. Granberry is a first-year Internal Medicine/Pediatrics resident of University of Texas Southwestern Medical Center, Dallas, TX, USA, and was the founder of the Mental Health Matters organization during her time in medical school. She is passionate about continuing to work with organizations in her community that support underserved and minority populations.*

Correspondence:

Robin C. Granberry

Address: 5323 Harry Hines Blvd., Dallas, Texas 75390.

Email: robin.granberry@utsouthwestern.edu

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Methods

This study employed a community-based participatory approach to develop and evaluate a pilot short-term mental health curriculum with longitudinal evaluation targeting minority youth. The study population consisted of 10th-grade students from diverse minority backgrounds, including Asian, Black, and Latino/Hispanic youth, who participated in an after-school program facilitated by the Vickery Meadow Youth Development Foundation in Dallas, Texas. Data collection occurred between 2022 and 2023, encompassing a needs assessment phase, curriculum implementation, and pre- and post-intervention evaluations to measure changes in mental health knowledge and perceived confidence related to key curriculum objectives.

Institutional Review Board: The study was reviewed by the IRB Committee of UT Southwestern Medical Center and determined to fit the criteria for non-regulated research.

Needs Assessment: A needs assessment was conducted in 2022 to determine which specific mental health topics were most important for those who serve minority youth in Dallas. 32 organizations responded to the needs assessment. Likert-scale questions such as "How beneficial would it be to learn about the spectrum of mental health states and the difference between emotions and mental illnesses?" and open-ended questions such as "What mental health topics do you think would be helpful to learn about?" were used to gauge community interest in mental health topics.

Partnership Development: The *Mental Health Matters* (MHM) was founded in 2020 as a medical student organization at University of Texas Southwestern (UTSW) with the mission to improve the mental health of underserved youth in the Dallas area. MHM partnered with the Vickery Meadow Youth Development Foundation (VMYDF), a non-profit that provides opportunities for youth in the Vickery neighborhood in Dallas, Texas. MHM and VMYDF leadership to develop a mental health curriculum using VMYDF's pre-existing after-school program for minority youth.

Curriculum Design: The needs assessment revealed the importance of the following mental health topics: coping techniques for emotional regulation, interpersonal communication strategies, resources for seeking help and setting safe boundaries. Four lessons were created that focused on: general background information about mental health, the stress response and stress-relieving tactics, specific coping skills and resources for receiving help, and communication styles and conflict resolution strategies. Lessons were delivered in an interactive small group learning session, utilizing slideshows and various small group discussions and activities designed to increase participant engagement.

Participants: 10th grade minorities (Asian, Black, and Latino/Hispanic), who attended VMYDF's after school program.

Measures: We developed a pre- and post- lesson survey for each lesson that included both a knowledge assessment and self-assessment (perceived confidence) to measure the students' understanding of lesson objectives. The knowledge assessment included multiple choice questions assessing how students' knowledge of the lesson objectives changed before and after attending the lesson. The self-assessment portion of the surveys asked students to rate their level of knowledge or skill on a scale of 1 to 5 on the objectives of each session (Likert-scale scoring style). Due to time constraints in implementing the first session of the curriculum, pre-lesson multiple choice questions (MCQs) were not administered for lesson 1. Surveys had open-ended responses for "strengths and limits of the lesson" to minimize biases in student feedback on the classes. Survey content validity was evaluated by face value evaluated by researchers and reliability was evaluated through an intraclass correlation coefficient (ICC).

Analysis: There were two main quantitative analyses: one that assessed student's learning with the MCQ questions (knowledge assessment), and one that gauged students' learning through self-assessments (perceived confidence). Utilizing histogram, we identified that both sets of data were non-parametric. Since we used ordinal data, we used a Wilcoxon signed-rank test to assess student performance on each lesson and included effect sizes (matched pair rank-biserial correlation(r_x)) as well as significance. For rank-biserial correlation effect size, r_x= 0.1 is a small effect, r_x= 0.3 is a moderate effect, and r_x= 0.5 is a large effect. With perceived confidence analyses, each student was a subject, and each student/subject's paired data was their averaged confidence on objectives before and after the lesson. With the knowledge assessment questions, each student/subject's paired data was their average percentage performance (out of 100%) on the MCQ questions before and after the lesson. The statistical analyses in this study were conducted using scipy.stats version 1.7.1 on Python version 3.9.7. The statistical significance for all analyses in this study was expressed as a p-value less than 0.05 on two-tailed tests.

Results

Needs Assessment: A total of 32 respondents completed the needs assessment survey. 84% of responses indicated that cognitive techniques would be "very beneficial" to the youth they served. Among the free responses received in the needs assessment, "trauma processing", "field trips", and "self-control/regulation" were some of the top requested mental health concepts that organizations wanted to be included in the curriculum. To increase attendance of the sessions, "[hosting] on-site/at community center" lessons, providing "virtual meetings", and "[providing] incentives" were suggested strategies.

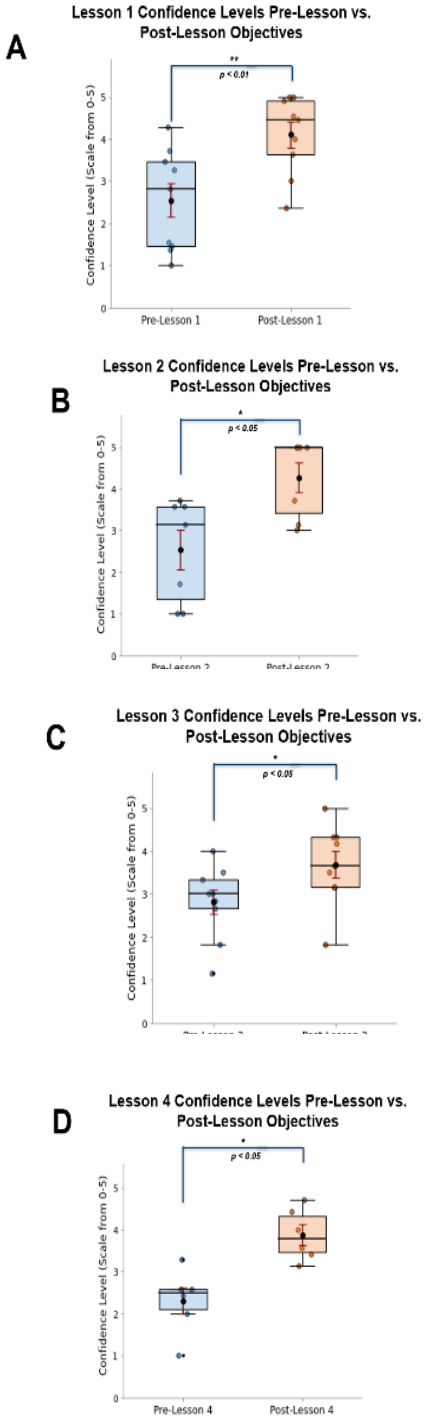
Quantitative Results: There were 8-10 participants for each lesson. 31 of the 37 pre and post survey were complete for the perceived confidence questions, and 23 of the 37 pre and post survey were completed for the knowledge-based questions. There were logistical issues so none of the students in lesson 1 completed the knowledge-based questions. For perceived confidence questions, there was a statistically significant average increase in perceived confidence on lesson objectives for each

Table 1. Qualitative Feedback of the Mental Health Curriculum.

	Representative Quotation(s)
Student Feedback	
Instructional Approach	- "Great explanation" - "I like how it was interactive and hands-on" - "This lesson is fabulous"
Mental Health Knowledge	- "I [learned] more about mental health" - "Self-control and support can help a [stressed] person" - "What mental health means"
Gained Skills	- "If you are [stressed], call someone or the number [they gave us] and do some yoga" - "Try new coping mechanisms that [students] may not have thought about or that they didn't think they'd like, for example yoga" - "To be able to handle stress or to reach out when feeling suicidal" - "Cope with stressors" - "Relaxing and [communicating]"
Constructive Feedback	- "Maybe [the lesson could be] longer" - "[Show] video and more games"
Administrator Feedback	
Student Anecdotes	- "A Scholar mentioned that they used to journal to relieve stress/work through personal experiences and that one session in particular allowed them to reconnect with this important coping tool for them. They continued to journal outside of this session." - "Another scholar mentioned that in his family mental health wasn't discussed at all. A major tragedy had struck their family, and family members were essentially minimizing the event in order to survive the grief they were all experiencing. The session allowed the Scholar to make connections to the importance of expressing what they are going through and provided the Scholar with relevant terminology and discussions."
Constructive Feedback	- "Addressing how to take care of one's self when living in a joint family or in a home with many members, lots of noise, and very little personal space." - "More culturally relevant practices could be incorporated and activities/thought exercises that put the Scholar's voice at the forefront of the learning experience."
Curriculum Adaptability	- "I think it's a great foundation that is buildable and can be adapted to different settings and community needs."

legend. Representative quotations for each theme of feedback received from students and administrators.

Figure 1. Perceived Confidence Levels Before and After Each Mental Health Lessons.

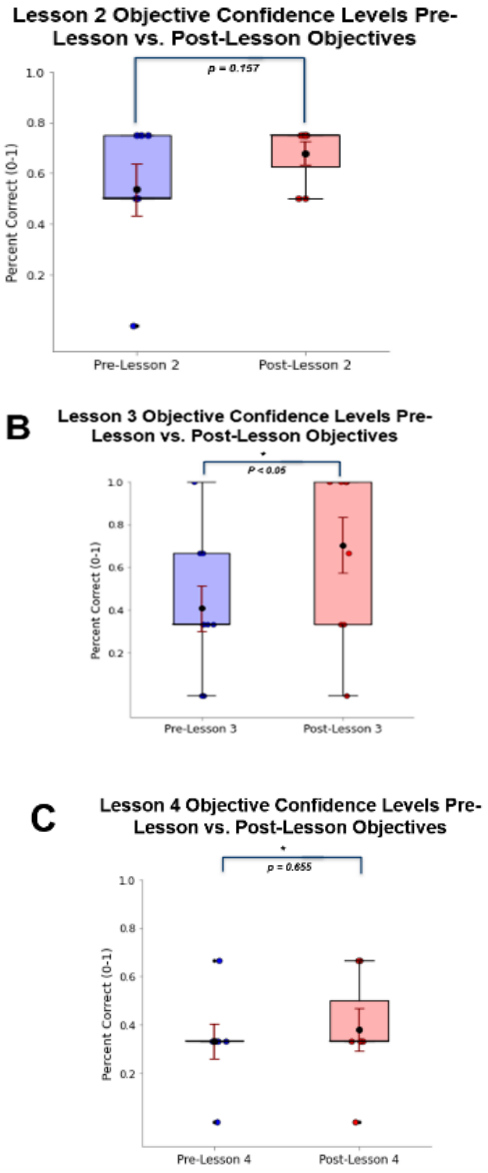


legend. Box plots depicting average student perceived confidence (scaled from 0 - 5 ("0" indicating no awareness/understanding, "5" indicating full awareness/understanding)) before and after the lesson [n= 9, 7, 9, and 6 for Lessons 1, 2, 3, and 4]. Each data point corresponds to the average perceived confidence for all of the lesson's objectives of a specific student. Standard error bars are included in red.

session: fundamentals of mental health ($p = 0.008$, $r_x = 0.16$); the stress response, box breathing, and perceiving stress ($p = 0.046$,

r_x = 0.14); coping skills and how to get help (p = 0.025, r_x = 0.13); and communication styles and conflict resolution strategies (p = 0.031, r_x = 0.29, ***Figure 1).*** Similar results were seen in the increases in the percent-correct for the MCQs for each lesson, but only one was statistically significant: lesson of stress response, box breathing, and perceiving stress (p=0.157); lesson of coping skills and how to get help (p=0.042, r_x = 0.11); lesson of communication styles and conflict resolution strategies (p=0.581, ***Figure 2).***

Figure 2. Knowledge Assessment Performance Before and After Each Mental Health Lessons.



Legend. plots depicting average multiple choice student scores (scaled from 0 - 1 ("0" indicating 0% of the students got the question right, "1" indicating 100% of the students got the question right)) before and after the lesson [n= 7, 8, and 7 for Lessons 2, 3, and 4]. Each data point corresponds to the average percent correct from all the multiple-choice questions of the lesson of a specific student. No Pre-Lesson MCQs were administered for Lesson 1. Standard error bars are included in red.

Qualitative Results: Students and administrators provided free-response feedback on lesson strengths and areas for improvement ***(Table 1).*** Students praised the instructional approach, increased understanding of mental health knowledge, and new ways to cope with stress. Administrators gave student anecdotes about how the students have benefitted from the mental health curriculum and praised the curriculum adaptability. The feedback was then grouped into themes and a frequency thematic analysis was done, ranking the frequently prevalent themes ***(Table 2).***

Discussion

Our study highlights the success of a local academic-community partnership focused on developing and evaluating a short-term mental health curriculum tailored for minority youth. The results indicate that the curriculum was largely effective in enhancing students' perceived confidence across all mental health learning objectives, with significant improvements observed across all four lessons. However, only one lesson showed a significant increase in knowledge assessment scores, a limitation likely attributable to the study's limited power and small sample size. While the quantitative data provided a strong baseline, qualitative feedback from participants further enriched our understanding. Students detailed specific learning experiences and expressed appreciation for culturally relevant content, which was not entirely captured in the structured assessment.

Table 2. Qualitative Thematic Analysis of Mental Health Curriculum.

Themes of Feedback	% Prevalence of Theme in Feedback
Student Feedback	
Mental Health Awareness	41%
Stress Coping Strategies	35%
Communication and Support	23%
Administrator Feedback	
Mental Health Awareness	28%
Stress Coping Strategies	20%
Environment and Support	20%
Cultural Relevance of Lessons	16%
Generalizability	16%

legend. Representation quotations group by themes and ranked most frequently to least frequently.

Our findings align with existing literature on short-term mental health interventions. School-based curricula have been shown to improve mental health literacy and reduce stigma among high school students[10]. Brief, resilience-focused programs have similarly demonstrated significant improvements in psychological well-being among adolescents[11]. Structured curricula can have a meaningful impact even without extended follow-up, emphasizing the relevance of our approach in school-based settings[12]. Additionally, evidence from the Early Intervention

Foundation highlights that culturally tailored, school-based interventions, such as those incorporating social and emotional learning, can effectively support adolescent mental health including minority youth[13]. This emphasizes the benefit of content resonating with participants' lived experience[13]. While studies suggest that extending the duration of mental health programs can enhance a sense of community and strengthen mental health skills, longer interventions often face challenges such as attrition and limited resources, making short-term approaches both practical and impactful[14].

A key strength of our intervention is the academic-community collaboration, which significantly facilitated implementation and engagement. Such partnerships have been found to yield benefits, including resource advocacy, program development, and comprehensive community health assessments[15]. By fostering shared ownership, these collaborations can result in more sustainable and culturally sensitive interventions[15]. Our curriculum was designed to reflect the students' identities and experiences by incorporating diverse imagery and resources tailored to various needs, such as support for Spanish-speaking and LGBTQIA+ populations. Additionally, having medical student instructors from Mental Health Matters created a more inviting atmosphere, encouraging open dialogue. The curriculum's flexibility also allows it to be delivered effectively by non-mental health professionals, making it adaptable for diverse educational contexts.

Despite the promising outcomes, our study is not without limitations. The absence of a control group makes it challenging to definitively attribute observed changes to the curriculum. Additionally, potential variability in lesson completion rates could have influenced the results. Furthermore, only one of the lessons produced significant knowledge gains, possibly due to differences in lesson complexity or engagement. Future studies should investigate these discrepancies to optimize the curriculum. The small sample size and lack of long-term follow-up also limit the generalizability of our findings. As such, future research should incorporate larger, more diverse samples and explore methods for sustaining mental health gains over time, such as digital follow-up tools or booster sessions. Improved community collaboration could facilitate more extensive tracking and better support for participants.

In conclusion, while our short-term curriculum provides a valuable model for engaging minority youth in mental health education, addressing these limitations in future iterations will enhance its effectiveness and broader applicability.

New Contribution to the Literature: This paper describes an academic-community partnership that led to the development and implementation of a mental health curriculum. Findings suggest that a longitudinal four-session curriculum can improve mental health knowledge and coping skills among minority youth in an urban, metropolitan area.

Summary – Accelerating Translation

Minority youth are at increased risk for mental health issues in the United States. Early intervention with mental health curriculum has been shown to help build resilience and wellness. Our aim was to develop and implement a mental health curriculum for minority youth. Our method consisted of a needs assessment for marginalized youth in our community. The needs assessment identified need for youth training in emotional regulation and insight, and interpersonal communication. We then developed a short-term mental health curriculum with a local community partnership, Vickery Meadow Youth Development Foundation (VMYDF). With the academic community partnership, we implemented the curriculum in an after-school program for minority youth. We evaluated our results using a pre-survey and post-survey. Quantitative feedback showed improved in perceived confidence and knowledge of mental health topics. These mental health topics included fundamentals of mental health; stress response; coping skills; and communication styles/conflict resolution strategies. Qualitative feedback highlighted strengths of the adaptability and practicality of the curriculum. Overall, we successfully developed a pilot mental health curriculum based on a community needs assessment for minority youth.

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Author Contributions

Conceptualization: RG, VM, and LF. Methodology: RG, VM, LF, WT, HL, and TP. Software: RG, VM, and LF. Validation: RG, VM, LF, and WT. Formal Analysis: RG, VM, and LF. Data Curation: RG, VM, LF. WT. and TP. Investigation: RG, VM, LF, WT, HL, and TP. Resources: RG, VM, LF, HL, and TP. Writing – Original Draft: RG, VM, LF, and WT. Writing – Review & Editing: RG, VM, LF, WT, HL, and TP. Visualization: RG, VM, LF, WT, HL, and TP. Supervision: HL, and TP. Project Administration: RG, VM, LF, WT, HL, and TP.

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Reviews

Academic Burnout in Mexican Medical Students: A Critical Review of Prevalence, Risk Factors, and Gaps in Intervention

Ángel Alberto Puig-Lagunes,[1] Lessa Alessandra Méndez-Lara,[2] Fabiola Ortiz-Cruz[3]

Abstract

Academic Burnout Syndrome (ABS) is a state of emotional exhaustion detachment, and decreased academic efficacy from the educational environment that affects university students in various disciplines. The combination of an intense academic load, high expectations, competitiveness among students, and other factors during their education negatively impact academic refinance, well-being, self-esteem, and overall quality of life. This review aims to summarize the main findings and recent advances in ABS for medical students in Mexico while identifying areas that require further attention and proposing lines of research to improve the understanding and treatment of this problem. A critical narrative analysis was performed after an exhaustive bibliographic search for articles in both English and Spanish in different a range of databases, including PubMed, Google Scholar, Redalyc, SciELO, and DOAJ. The search was conducted between January and July 2023. Randomized trial articles and original research were included in the analysis. Meta-analyses and incomplete studies were excluded, resulting in 22 selected studies. Despite the large number of studies conducted on ABS in medical students in Mexico, a significant part focuses on descriptive characteristics. At the same time, other aspects, such as prevention, treatment, and awareness of this problem, are often overlooked. To effectively address ABS, academic communities must implement comprehensive preventive and curricular measures that promote student well-being and create a supportive learning environment.

Introduction

The term "Burnout" was initially coined by the American psychiatrist Herbert Freudenberger to describe a state of exhaustion, fatigue, or demotivation resulting from an excessive workload. This phenomenon leads to a decreased effectiveness within an individual's environment, exhibiting signs of impairment in both behavior and physical condition.[1] Subsequently, Maslach and Jackson redefined burnout as a psychological syndrome characterized by the presence of discouraging emotions, including emotional exhaustion, depersonalization, and low personal efficacy.[2] Burnout syndrome (BS) represents a persistent and adverse mental state that develops from chronic interpersonal tensions within the work environment among individuals who are otherwise considered normal.[3-4] Initially, BS was thought to only affect professionals with constant and direct interaction with others. However, evidence has shown that it can affect anyone, regardless of their activities, even in sports and academic settings.[5-6]

In the academic context, "Academic Burnout Syndrome (ABS)" refers to a condition in which students experience physical and emotional exhaustion due to prolonged academic demands. This syndrome is characterized by fatigue, diminished interest in academic activities, and feelings of cynicism, inadequacy, and incompetence about their performance as students.[6] ABS affects their sense of accomplishment and satisfaction with their studies and reduces their overall motivation and well-being.[6-8]

Medical Students are exposed to pressure and academic demands, that, when combined with the effects of intense stress, mood swings, psychological disorders, cognitive appraisal, and coping strategies, may contribute to the development of ABS,[8-11] as demonstrated in university students from Spain, Portugal, and the Netherlands.[6]

Medical students are exposed to these factors from the beginning of their undergraduate studies, with the intensity of this exposure culminating during their undergraduate internship in a hospital setting. These students are simultaneously undergoing medical training and assuming the role of hospital workers. This dual role places them in a position where they must navigate the responsibilities assigned to them about patients and the specific

[1] MSc, PhD, School of Medicine, Universidad Veracruzana, Minatitlán campus, Veracruz, Mexico.

[2] Third -year Medical Student. Universidad Veracruzana, Minatitlán campus, Veracruz, Mexico.

[3] MSc, PhD, School of Dentistry, Universidad Veracruzana, Minatitlán campus, Veracruz, Mexico.

About the Author: *Lessa Alessandra Méndez-Lara is currently a third-year medical student of the School of Medicine, Universidad Veracruzana, Minatitlán campus, México, of a seven-year program. She is a recipient of four commendations for maintaining a semester GPA above 9.0. Has completed several courses and attended congresses accredited by the Mexican Council of Pediatric Accreditation and the National Institute of Pediatrics, along with a diploma in pediatric infectious diseases. Currently, she is a research assistant fellow working with an investigator affiliated with the National System of Researchers (SNI).*

Correspondence:

Ángel Alberto Puig-Lagunes

Address: Managua s/n, Colonia Nueva Mina, C.P. 96760, Minatitlán, Veracruz, Mexico.

Email: anpuigl@uv.mx

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demands of each hospital service.[12-14] Many studies have shown that ABS occurs more frequently, ranging from 15 to 36 percent in medical students, residents, and physicians compared to undergraduate students in other disciplines and the general population.[8,13-15]

Recent systematic reviews and meta-analyses involving 44,255 medical students worldwide have reported a general prevalence of ABS ranging from 37.2% to 44.2%.[16-17] These findings are consistent with those observed in Latin America. In Brazil, ABS is observed in 13.1 to 28.2% of medical students.[18-20] In Peru, the prevalence ranges from 2.44% to 57.6%.[21] In Colombia, the prevalence of ABS ranges from 14% to 30.8%.[22-23] In Guatemala, the prevalence fluctuates from 5% to 13%,[24] and in Ecuador, the prevalence varies from 14% to 90%.[25-26]

The consequences of ABS are far-reaching, affecting not only the mental health and well-being of students but also their academic performance and their ability to provide quality medical care.[10-11] The value of studying ABS in university students lies in avoiding or mitigating potential adversities in the short term, particularly in terms of well-being and negative affection in their academic activities and performance.[8,11,27] In the long term, it can affect job satisfaction, procedural errors, and the likelihood of experiencing exhaustion in future medical practice.[28]

This knowledge highlights the necessity of implementing early intervention and prevention strategies that integrate psychological and practical approaches within academic medical institutions. These strategies aim to reduce ABS among medical students by fostering self-care, self-compassion, and resilience while promoting a balanced approach to study and personal life.[15,19] Furthermore, it is recommended that stress management techniques, such as meditation and regular exercise, be encouraged.[29-31] The creation of emotional support spaces, the implementation of psychological counseling, and the implementation of wellness programs and psychological assistance should be considered as well.[31-33]

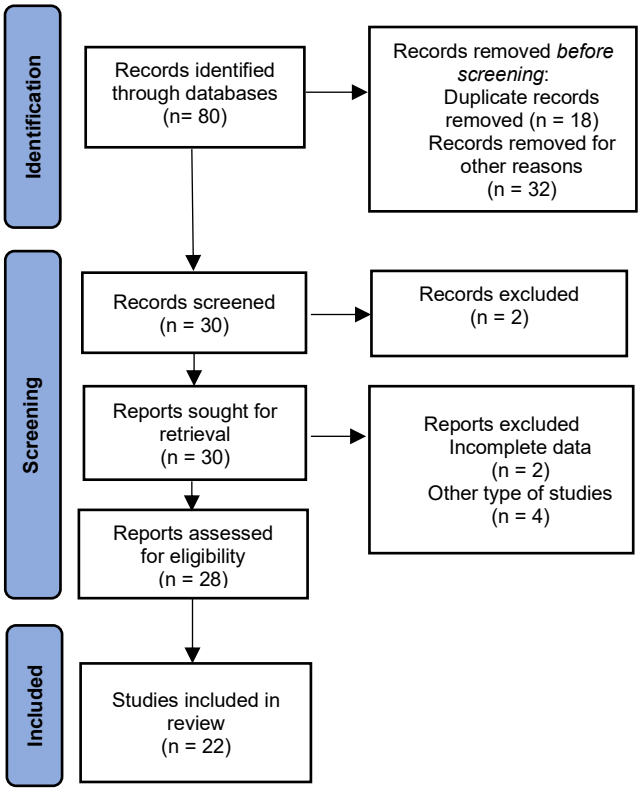
As previously mentioned, the Mexican medical education system has several characteristics that may contribute to the development of ABS among its students. In addition, there are deficiencies in the availability and accessibility of psychological services with adequate follow-up, limited flexibility in schedules, and other factors that slow the proper study of ABS. Although the phenomenon has been widely studied, Mexican medical students face unique sociocultural and institutional factors that have not been critically synthesized. Therefore, this review aims to delineate the prominent advances in ABS among medical students in Mexico, identify potential areas that require further attention, and develop research proposals to improve our understanding, prevention, and treatment of this phenomenon.

Methods

A critical narrative analysis was conducted, derived from an exhaustive literature search in search engines such as PubMed, Google Scholar, Redalyc, SciELO, and DOAJ, covering the period from January 2023 to July 2023. The objective was to identify references on the measurement of ABS in Mexican medical universities. This objective was accomplished by a combination of English and Spanish terms, including "burnout," "burnout syndrome," "academic burnout," "medical students," "medical school students," "medical school," "Mexico," and "Mexicans." To refine the results, Boolean operators such as "and," "or," and "not" were employed. These operators were used to systematically search the databases mentioned above, ensuring comprehensive and meticulous coverage of the study topic.

The search yielded articles measuring ABS in medical students published during the specified period. The articles were available in English and Spanish and offered free or full access. Priority was given to randomized trials and original articles to obtain a comprehensive and current perspective on the subject. The following types of articles were excluded: review articles, systematic reviews, and meta-analyses; articles with incomplete results; and studies not directly related to burnout in Mexican medical students. As a result of this rigorous selection process, a total of twenty-two relevant articles were identified and included in the review, as shown in ***Figure 1.***

Figure 1. Flowchart of Inclusion and Exclusion Screening and Accepted Studies from the Review on ABS in Mexican Medical Students.



Study selection and data extraction

A single reviewer conducted the study selection and data extraction process, initially assessing the titles and abstracts. A

second author selectively reviewed some titles and abstracts to ensure consistency and accuracy. Any discrepancies were discussed until a consensus was reached. Full articles were obtained for potentially relevant studies. The inclusion criteria were then applied, and the following data were extracted: lead author, publication year, country, sample, outcome measure, primary aim, and key findings.

Data Analysis and Quality Assessment

The findings were subjected to a comprehensive data synthesis approach conducted in stages aligned with the review's objectives. Data patterns were manually explored to identify consistent findings related to the study objectives. Summarize eligible studies and their results were compiled and presented in ***(Table 1).*** The quality assessment ensured that the conclusions drawn were based on high-quality evidence by examining crucial factors in each study, such as the clarity of research objectives, the appropriateness of the study design, the recruitment strategy, the data collection techniques, the ethical considerations, and the validity and reliability of the findings.

Results

Epidemiological of ABS among Mexican medical students

Available research in Mexico indicates that the prevalence of ABS ranges from zero to 96% ***(Table 1).***[35-56] Among college students, the most commonly reported prevalence ranges from 15 to 45%.[35-43,45-48,50-51,56] On the contrary, some studies have documented a lower prevalence rate of below 10%,[40,44,49,54] while others have reported a higher rate of more than 70%.[36,39,41,52-53,55]

Regarding gender, some reports indicate that there are no significant differences in the prevalence of ABS.[25-26,28,50,56] However, other studies have found that male students have a prevalence and intensity of the ABS components up to 20% higher than that observed in females.[35,39,42,44,46] Jezzini-Martinez et al (2022),[46] indicate that men are three times more likely to develop burnout than women. In addition, higher levels of depersonalization were observed in men (37.7%) compared to women (15.7%),[44] as well as a higher likelihood of experiencing severe emotional exhaustion.[39] Furthermore, some researchers have proposed an alternative viewpoint, suggesting that women are more likely to exhibit ABS or its components.[30,52]

Several studies agree that ABS is more prevalent and more pronounced among students in their final semesters, with frequencies ranging from 7 to 36.9%.[12,35-46,48,52,56] For example, observations have shown that students in their fifth and sixth year college have elevated levels of ABS. Students exhibit elevated levels of ABS components compared to their earlier years.[28,42] Additionally, the prevalence of cynicism increases as the academic semester progresses.[40]

Conversely, numerous studies have demonstrated a positive association between older age of students and the incidence of ABS.[35,38] A study conducted on students at the Military Medical School revealed that the older age group, exhibited a frequency of burnout between 6 and 12% higher than that observed in students under 25.[35] In studies that have included undergraduate medical interns, the reported prevalence has ranged from 3.6% to 70%. The most frequently reported figures are around 15% and 35%.[37-38,40,48] However, studies have also identified prevalence as low as 5%,[44] and as high as 70%.[53]

ABS diagnosis among medical students in Mexico

Several instruments have been developed and used in Mexico to assess burnout among medical students. The most common instruments are the Maslach Burnout Inventory-Student Survey (MBI-SS) and its variants, including the Maslach Burnout Inventory (MBI); Human Services Survey (MBI-HSS),[35-50,55-56] the Unidimensional Scale for Academic Burnout (EUBE),[36] the Questionnaire for Professional Burnout- Abbreviated (CDPE-A)[52] and the Questionnaire for Evaluation of Burnout at Work (CESQT).[53]

The MBI-SS is an adaptation of the MBI, designed specifically to assess burnout in college. It consists of 22 items in three subscales assessing emotional exhaustion, depersonalization, and academic self-actualization. The MBI-SS is considered a valid and reliable instrument, the most widely used worldwide, and serves as a benchmark for comparison, allowing researchers to contextualize findings across research settings.[35-50]

The EUBE is a unidimensional instrument consisting of 15 items that assess burnout across three subdimensions: physical, emotional, and cognitive exhaustion. These subdimensions are further divided into behavioral and attitudinal indicators of academic burnout.[36,52]

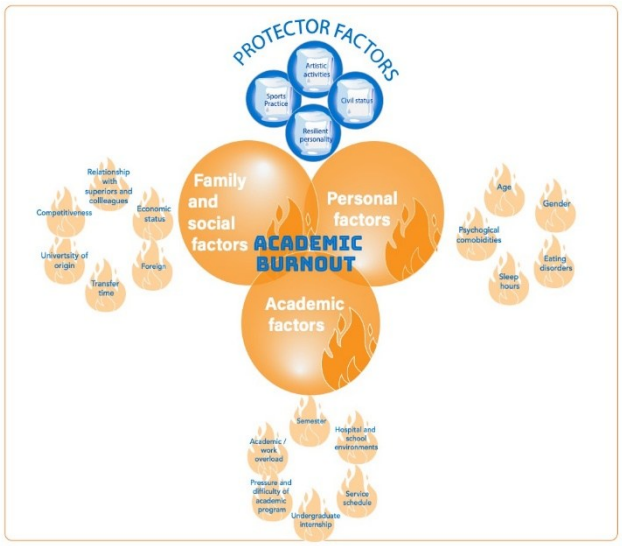
The CDPE-A is a psychometric instrument designed to assess variables associated with the process of professional burnout and resilience personality.[57] This questionnaire has been adapted to align with the characteristics of the university population immersed in the hospital environment. It consists of 65 items divided into five subscales.[53]

The CESQT, developed by Gil-Montes in 2011,[58] comprises 20 items divided into three dimensions: (a) cognitive impairment, (b) affective impairment, and (c) indolence. Low scores in cognitive impairment and high scores in affective impairment are considered the initial indications of ABS. These symptoms can elicit negative attitudes toward colleagues, as reflected in elevated scores in indolence.[59]

Risk Factors for ABS in Mexican Medical Students

Several studies have identified factors that contribute to the development of ABS among medical students in Mexico ***(Figure 2).*** One of the most important factors is being in advanced semesters. Several reports have concluded that students in late semesters have a higher prevalence and severity of ABS components compared to those in early semesters.[35-36,39,42-43,52,56]

Figure 2. Risk and Protective Factors Associated with the Development of Academic Burnout Syndrome in Mexican Medical Students.



Similarly, gender is another widely reported risk factor among medical students in Mexico. As previously indicated, some research suggests that men exhibit a higher prevalence and more severe symptoms of ABS compared to women.[42,44,46] Conversely, several studies indicate that women demonstrate a higher prevalence of ABS.[36,39,47,52] This trend is reinforced by some authors' observations indicating that women tend to experience greater emotional exhaustion.[39,52]

On the other hand, research has demonstrated a notable correlation between students experiencing psychological disorders, such as anxiety and depression, and elevated levels of ABS, which is a significant risk factor.[36,38,43,50-51,55] Additionally, a positive correlation has been identified between the manifestation of risky eating behaviors and higher levels of burnout.[43]

Other variables that may be considered risk factors for emotional exhaustion, depersonalization, and lack of personal accomplishment include age,[35,38] socioeconomic level,[52,55-56] foreign origin or residence in a different city,[42] alcohol, tobacco, and illicit drug consumption,[36,47] travel time to the faculty and university of origin,[37] class and clinical practice schedules, classroom environment, as well as the relationship with teachers.[30] Furthermore, Plett-Torres et al. (2018) have suggested that the level of pressure or difficulty of programs may also be a risk factor for the development of ABS components.

In the context of undergraduate medical interns, it has been observed that they present higher levels of ABS or various dimensions compared to students who have not yet begun this stage.[36,38,44,55] Furthermore, it has been found that belonging to the emergency, internal medicine,[37] surgery,[38] gynecology and obstetrics[37] services are associated with an elevated risk of developing ABS.

Additional factors that have been identified as potential contributors to the development of this syndrome include greater seniority in the undergraduate internship, the average number of surgeries performed during the working day, the number of hours of service, the number of hours of sleep, scarcity of resources, on-call duty, the work environment, and feelings of pressure associated with the work. These factors are e related to a greater risk of developing this syndrome.[38,45,48,54-56]

Protective factors against ABS in Mexican Medical Students

Additionally, few studies have addressed the factors that could act as protectors for the development of ABS. It has been reported that medical students who engage in sports are negatively associated with the development of ABS.[43] Similarly, students who participate in artistic activities such as playing a musical instrument, singing, or acting present fewer components of ABS and experience lower levels of cynicism and burnout.[49]

Furthermore, research suggests that a personality trait known as "resiliency" may play a moderating role in the development of burnout. Individuals with higher scores in resiliency tend to demonstrate lower levels of burnout, particularly in the context of ABS components.[53] Additionally, findings from a study by Joanico-Morales et al. (2019) highlight a potential protective effect of being single or divorced on the likelihood of developing burnout.[37]

The impact of ABS on medical students in Mexico

The potential implications of the introduction of ABS in medical education in Mexico have not been extensively investigated. It has been demonstrated that individuals experiencing elevated fatigue levels tend to present a decline in their capacity to make decisions, learn effectively, and achieve academic success.[35,46]

A study by Jezzini-Martinez et al. (2022)[46] indicated that men who exhibited a greater tendency towards cynicism and ABS demonstrated lower academic efficacy, which could be attributed to the consequences of burnout. In the context of the ongoing pandemic, recent reports have indicated that medical students experiencing burnout exhibit various concerning behaviors and attitudes. These include distrust in the knowledge they have acquired, fear of academic failure, concern about their future professional prospects, family pressure, lack of leisure time, and substance abuse.[47]

On the other hand, an investigation into the academic performance of surgeons at the Military Medical School indicated that those at risk of burnout exhibited a marginally higher academic average than their counterparts without ABS. This observation may indicate that academic pressure plays a significant role in the emergence of the syndrome.[35]

Discussion

In general, ABS in medical students has been the subject of a considerable number of publications at the national level. These publications have focused primarily on determining its prevalence and comparing it across years, ages, and genders. In addition, they have sought to identify risk and protective factors that have helped to elucidate the problem. In Mexico, the prevalence of ABS among medical students ranges from 20 to 45%. The main risk factors identified are the semester, gender, excessive academic load, and comorbidity with anxiety and depression, among others. Conversely, the protective factors identified include participation in sports, playing musical instruments, and singing. It is necessary to identify the consequences and implement intervention strategies to reduce the prevalence and impact of ABS within the faculties.

The prevalence of ABS shows considerable variation in studies conducted in other geographic regions, with reported rates ranging from 25% to 45%.[16-26] Although prevalence within this range has been reported in Mexico,[35-38,42,45-46,48,50-51] some studies have documented prevalence of less than 10%,[40,44,49,54]. In contrast, other reports exceed 70%.[36,39,41,52-53,55] The discrepancies in the prevalence observed in different studies in Mexico can be attributed to several factors, including the period in which the research was conducted, the size of the sample, the methodology used, the semester in which the students were studying, the type of institution, the use of different assessment tools, and diagnostic criteria for the syndrome.[16-17,57-58] In addition, it should be taken into account that this syndrome is a complex condition that is influenced by the interaction of numerous ***variables*** ***(Figure 1).***

Although most studies have used the Maslach Burnout Inventory in its two validated versions, there are discrepancies in the interpretation of the diagnostic criteria. The ABS is diagnosed when all three dimensions are present: high scores on the emotional exhaustion and depersonalization subscales and low scores on the personal accomplishment subscales.[57-62] For decades, ABS has been viewed from a three-dimensional perspective, which is divided into the following categories: (I) emotional exhaustion, which refers to the diminished emotional resources to face the demands related to their studies; (II) depersonalization, which implies the development of negative attitudes, insensitivity, and cynicism toward their peers or professors; (III) lack of personal accomplishment, which dimension is closely related to the negative self-evaluation of academic performance and the experience low professional efficacy.[6-7,34]

However, some studies suggest that the presence of two or even only one component is sufficient to consider the presence of ABS.[7,27,60-62] In addition, some studies fail to mention the criteria used. Understanding the diagnostic criteria and omitting others, can minimize errors in interpretation and the problems of underestimating or overestimating ABS in the student population.[57] This is an important consideration, as most of the studies conducted in Mexico that have reported a high prevalence of ABS did not include these criteria or used alternative instruments ***(Table 1).***

To the extent possible, it is of the utmost importance to refrain from using other instruments, as they may impede the comparison between different populations or result in misinterpretations. This perspective does not question the validity, consistency, and reliability of other ABS diagnostic tools used at the national level. Rather, it emphasizes the need to consider the differences that may arise in comparison with studies in which the MBI-SS was used. In this sense, it is important to exercise caution to avoid indiscriminate generalizations or the extrapolation of results to similar populations.

As in international research, ABS among medical students in Mexico has been associated with several personal and academic/work environment factors. The most significant factors are gender, age, academic level, inadequate support from faculty and parents, hospital conditions, stress related to teaching and learning, depression, anxiety, academic and family pressure, working while studying, and substance use.[8,11,14,16,18-19,24-27,63] However, additional factors, such as the structure of clinical training and exposure to cynical residents, as well as aspects of mental health, including suicidal ideation and impulsivity, have been linked to an increased likelihood of ABS. These factors have not been extensively investigated in our country.[8,14,27]

Regarding protective factors, it is notable that there has been comparatively little research conducted in Mexico in this area, particularly in comparison with international studies. These studies have identified several factors that may protect against burnout, including resilience, high level of commitment, satisfaction, suitable rest periods, advanced age, marital status, and good academic performance. Abreu-Alves et al. (2022) showed that the higher the social support satisfaction, adaptive coping mechanisms, and academic engagement, the smaller the dropout intention. Academic engagement reduces the impact of burnout on dropout intention, working as a protective factor.[6,11,19,29-31,64] Medical schools should implement interventions to prevent dropout intentions, address students' stress and academic challenges, and enhance their levels of academic engagement.

Despite evidence from studies in other countries, there is a lack of research focusing on individual competencies, such as emotional intelligence and resilience, and their role in the progression or prevention of ABS. An inverse relationship has been reported between adaptive coping mechanisms, such as spending time with family and friends, and the development of ABS. Furthermore, students with higher levels of resilience had a lower prevalence of ABS (46.9% vs. 86.0%), highlighting resilience as a key factor in mitigating burnout.[19]

In Mexico, studies specifically examining the development of ABS among students during their academic careers are scarce. In other countries, the detrimental effects of ABS have been well-documented, including reduced well-being, academic performance, and exam results.[67-68] Furthermore, medical

Table 1. Major ABS Studies Among Medical Students in Mexico in the Last Fifteen Years

Authors	Objective	Method	Main results
Barraza-Salas et al., 2009[38]	To determine the prevalence and intensity of ABS in UMIs. To know the general and mental health status of UMI and to identify the relationship between ABS and mental health status with personal and general characteristics.	Cross-sectional, descriptive study. **Population:** 25 UMIs of a Social Security Institution in the state of Nayarit. **Instrument:** MBI short version **Diagnostic criteria:** These are not specified in the paper.	**Prevalence:** 36% of the UMIs presented three dimensions of ABS. **Main findings:** High levels of ABS were reported to be associated with older age and the number of surgeries per day. High levels of Emotional Exhaustion were related to work overload, low Personal Accomplishment was associated with the work environment, and depersonalization was associated with the feeling of work pressure. 28% of the UMIs were proven to have a mental disorder.
Barraza-Salas et al., 2009[51]	To identify mental health indicators and ABS in medical students in a rotating internship in a health institution in Tepic, Nayarit.	Observational, descriptive, cross-sectional study **Population:** 17 UMIs of the general hospital of the Ministry of Health in Tepic, Nayarit. **Instrument:** MBI. **Diagnostic criteria:** High values of emotional exhaustion, depersonalization, and low values of personal accomplishment	**Prevalence:** 29.4% of the UMIs present ABS. **Main findings:** 94.1% considered that they have some mental disorder.
Barraza-Salas et al., 2009[55]	To identify the frequency and percentage of ABS in medical interns, their general health status, and the relationship of the syndrome and their general health status with personal and general characteristics.	Observational, descriptive, cross-sectional study **Population:** 18 UMIs of the ISSSTE in Tepic, Nayarit. **Instrument:** MBI. **Diagnostic criteria:** These are not specified in the paper.	**Prevalence:** 88.8% obtained 2 and 3 dimensions of ABS. **Main findings:** Significant associations were found between lower monthly income and low accomplishment and between work overload and emotional exhaustion and depersonalization. Similarly, a relationship was found between feeling pressured at work, emotional exhaustion, depersonalization, and the likelihood of developing a mental disorder.
Alcalá-Pacas et al., 2010[35]	To determine prevalence of the risk of presenting ABS and its relationship with the academic average and disciplinary indicators in students of the E.M.M.	Exploratory, descriptive, observational, cross-sectional, cause-effect study. **Population**: 380 Medical students (from 2nd to 5th year) of the E.M.M. **Instrument**: MBI. **Diagnostic criteria**: High values of emotional exhaustion, depersonalization, and low personal accomplishment.	**Prevalence**: 19.5% of the students present ABS. **Main findings**: Fifth-year and older students are at higher risk of developing ABS.
Camacho-Ávila et al., 2010[54]	To determine the prevalence of ABS in undergraduate and graduate medical students and its relationship with psychosocial factors, personality patterns and sociodemographic variables.	Observational, descriptive-correlational, cross-sectional study **Population**: 82 Medical students (39 undergraduates, 43 graduate) assigned to the Hospital General Regional # 1 of the IMSS. **Instrument**: CESQT. **Diagnostic criteria**: The perception of the frequency of symptoms was considered according to the anchors of the frequency scale.	**Prevalence**: 1.64% of the medical students presented ABS. **Main findings**: Scarcity of resources was found to be negatively associated with social support at work and positively related to Emotional Exhaustion. Sex and marital status were not found to be associated with ABS dimensions.
Ortega et al., 2014[53]	To analyze the association between perceived self-efficacy, hardy personality, locus of control, perceived stress, and ABS in undergraduate medical students	Longitudinal descriptive study, **Population**: 40 UMIs of three public hospitals of the second and third level of care in Xalapa, Veracruz. **Instrument**: CDPE-A, **Diagnostic criteria**: These are not specified in the paper.	**Prevalence**: 70% of the students showed high levels of ABS and high perceived stress. **Main findings**: The UMIs who perceived high-stress levels exhibited low scores on indicators of resilient personality. Additionally, there was a negative correlation between a resilient personality and a history of ABS. As the score on resilient personality increased, the scores on these indicators decreased.
Asencio-López et al., 2016[36]	To assess the prevalence of ABS in 1st to 6th-year medical students at a private university.	Cross-sectional study **Population**: 225 Medical students	**Prevalence**: 94.1% of students in the first to third year exhibited mild ABS, while 2.8% demonstrated moderate ABS. In the fourth to sixth year, 27.8%

		(153 were from first to third year and 72 from fourth to sixth year) of a private Med. Fac. in the state of Durango. **Instruments**: EUBE and MBI, **Diagnostic criteria**: These are not specified in the paper.	displayed moderate ABS, and 8.3% exhibited severe ABS. **Main findings**: The analysis revealed that working status, having economic dependents, chronic diseases, death of a family member in the last year, drug use, and belonging to an ethnic group did not exert a significant influence on the overall assessment of ABS.
Athié-Gutiérrez et al., 2016[37]	To determine the prevalence of ABS in medical students enrolled in the fifth year at the Hospital and to determine the associated risk factors.	Cross-sectional, observational, and descriptive study **Population**: 141 UMIs of the Hospital General de México Dr. Eduardo Liceaga, Mexico City. **Instrument**: MBI. **Diagnostic criteria**: high values of emotional exhaustion, depersonalization, and low values in personal accomplishment.	**Prevalence**: 16.3% of the UMIs presented ABS. **Main findings**: Burnout, commuting time, and university of origin were found to be related; on the other hand, no differences in ABS were found between genders
Galván-Molina et al., 2017[43]	To assess psychopathology and associated factors in medical students using an electronic self-report survey.	Cross-sectional, observational, and comparative study **Population**: 323 Medical students (1st, 3rd, and 5th years) of medicine at the Universidad Autónoma de San Luis Potosí. **Instrument**: MBI **Diagnostic criteria**: High values of emotional exhaustion, depersonalization, and low values in personal accomplishment.	**Prevalence**: 13% of the students presented ABS. **Main findings**: A positive association was found between ABS, grade, depression, and risky eating behavior, while a negative association was observed with the practice of sports.
González-Padilla et al., 2018[44]	To determine the prevalence of ABS and the intensity of its component variables in undergraduate medical students of clinical and internship cycles	Cross-sectional, correlational comparative study **Population**: 110 medical students (from 5th to 8th semester) from the Faculty of Medicine of the Quetzalcoatl University in Irapuato and UMIs of the IMSS and ISSSTE in the state of Guanajuato. **Instrument**: MBI-HSS. **Diagnostic criteria**: High values of emotional exhaustion, depersonalization, and low values in personal accomplishment.	**Prevalence**: 3.64% of the students presented ABS (1.82% for students and 1.82% in the UMIs). **Main findings**: Males presented greater depersonalization than females. The UMIs presented greater emotional exhaustion than the students.
Plett-Torres et al., 2018[49]	To determine the frequency of ABS, its dimensions in six students, and its correlation with sociodemographic, academic, and habit characteristics.	Descriptive, correlational study **Population**: 56 Medical students of the Combined Studies Plan in Medicine at UNAM, Mexico City. **Instrument**: MBI-SS. **Diagnostic criteria**: High values of emotional exhaustion, depersonalization, and low values in personal accomplishment	**Prevalence**: No student showed ABS **Main findings:** 61% of the sample showed no ABS dimensions, 34% showed one dimension, and 5% showed two.
Guillén-Graf et al., 2019[45]	To assess the prevalence of burnout at baseline and after one month of clinical rotation.	Observational and descriptive study. **Population**: 172 UMIs (in their clinical rotation of General Surgery, under a regimen of 80 hours per week of work, with guard duty every third or fourth day) the Fac. of Med. of the Tecnológico de Monterrey, in the state of Nuevo León. **Instrument**: MBI-HSS **Diagnostic criteria**: High values of emotional exhaustion, depersonalization, and low	**Prevalence**: 31.6% at baseline and 44.2% presented ABS after one month, indicating a significant increase. **Main findings**: There was an increase between baseline and after one month in emotional fatigue and depersonalization.

		values in personal accomplishment.	
Joanico-Morales et al., 2019[48]	To estimate the prevalence and identify the factors associated with ABS in undergraduate medical interns.	Analytical cross-sectional study, **Population**: 108 UMIs of the IMSS, Hospital General Regional # 1 Vicente Guerrero, in the state of Guerrero. **Instrument**: MBI. **Diagnostic criteria**: High values of emotional exhaustion, depersonalization, and low values in personal accomplishment.	**Prevalence**: 17.5% of the UMIs present ABS. **Main findings:** Higher prevalence of ABS and its dimensions in UMIs with greater seniority.
Miranda-Ackerman et al., 2019[56]	To determine the prevalence of ABS in medical interns and establish the relationships between this condition and the time and type of hospital students worked at during their medical internship.	Analytical cross-sectional study, **Population:** 176 UMIs at two public and two private hospitals in Jalisco. **Instrument:** MBI. **Diagnostic criteria:** High values of emotional exhaustion, depersonalization, and low values in personal accomplishment.	**Prevalence:** 20% of the UMIs present ABS. **Main findings:** The prevalence of ABS among second-semester IMUs (29%) was significantly higher than that first-semester (15%, p = 0.02). No significant differences were observed in ABS prevalence by gender, age, or between public and private hospitals.
Estrada-Hernández et al., 2020[42]	To identify the existence of ABS and its manifestations in medical students, comparing the intensity of the manifestations between first- and fifth-year students.	Observational, analytical, comparative, cross-sectional, and prospective study, **Population**: 114 medical students (1st and 5th year) of the faculty. de Med, private, in the state of Nuevo Leon. **Instrument**: MBI-SS. **Diagnostic criteria**: High values of emotional exhaustion, depersonalization, and low values in personal accomplishment.	**Prevalence**: 39.5% of the students presented ABS, of which 8.8% presented clinical ABS. **Main findings**: Those in the fifth year showed greater intensity of ABS manifestations. Students of foreign origin presented more ABS than those of Mexican origin.
Cano-Contreras et al., 2021[39]	To determine the association between academic grade and the incidence of ABS in medical students at the UV, Veracruz-Boca del Río campus.	Prospective, observational, descriptive study. **Population**: 177 Medical students (third and fifth year) of the Faculty of Medicine of the Veracruz-Boca del Río region of the UV. **Instrument**: MBI. **Diagnostic criteria**: High levels in at least one of the three dimensions.	**Prevalence**: 94% of the students presented some altered component of the ABS. **Main findings**: No differences were observed in gender and semester variables. Emotional exhaustion and personal accomplishment were observed to a greater degree in women.
Cantú-Alejo et al., 2021[40]	To describe the prevalence of ABS in medical students.	Cross-sectional, observational, and descriptive study **Population**: 385 Medical students (from 1st to 6th year) of the UANL School of Medicine. **Instrument**: MBI-SS. **Diagnostic criteria**: Use of percentiles where both extremes represent abnormal data according to each subscale.	**Prevalence**: 7% of the students presented ABS. **Main findings**: Emotional exhaustion was elevated in 6th-year students compared to the rest. A positive association between cynicism and semester was reported.
Martínez-García et al., 2021[52]	To estimate the prevalence of ABS in medical school students and to evaluate the internal consistency of the unidimensional student burnout scale (EUBE),	Observational, prospective, cross-sectional, descriptive study **Population**: 843 Medical students (from 1st to 5th year) of the School of Medicine of the Autonomous University of Sinaloa. **Instrument**: EUBE. **Diagnostic criteria**: Negative 0 to 25%, mild 25%- 50%, moderate 51%- 75%, and profound or severe 76%- 100%.	**Prevalence**: 85.9% of the students presented ABS. **Main findings**: More ABS in the female sex, higher school grade, and medium socioeconomic level

Puig-Lagunes et al., 2021[50]	To determine the prevalence and symptomatology of anxiety and ABS, as well as to identify their impact on the academic performance of medical students.	Cross-sectional, observational, and descriptive study **Population**: 72 medical students (last semester) from the Faculty of Medicine, UV, Minatitlan campus. **Instrument**: MBI. **Diagnostic criteria**: High values of emotional exhaustion, depersonalization, and low values in personal accomplishment.	**Prevalence**: 15.6% of the students showed ABS. **Main findings:** An association was found between ABS and the severity of state and trait anxiety. There is no relationship between Burnout and academic performance and gender.
Díaz-Flores et al., 2022[41]	To examine the academic demands and health behavior determinants of ABS in students at the School of Human Medicine of the UAZ.	Observational, analytical, and cross-sectional study, **Population**: 203 medical students (10th semester) in the state of Zacatecas. **Instrument**: MBI-SS. **Diagnostic criteria:** These are not specified in the paper.	**Prevalence**: 69.8% of the students presented ABS. **Main findings:** Classroom and clinical practice schedules influenced emotional exhaustion. The classroom environment was associated with personal accomplishment. An association was found between the relationship with teachers, lack of personal accomplishment, and depersonalization.
Jezzini-Martínez et al., 2022[46]	To establish the prevalence of ABS in first-year medical students.	Cross-sectional study **Population**: 154 medical students (1st year) from the UANL's faculty of medicine. **Instrument**: MBI-SS. **Diagnostic criteria**: High values of emotional exhaustion, depersonalization, and low values in personal accomplishment.	**Prevalence**: 14.9% of the students showed ABS. **Main findings:** 53.9% scored high on emotional exhaustion, 16.9% scored high on cynicism and 34.4% scored low on academic efficacy; Higher probability of developing ABS in males.
Jezzini-Martínez et al., 2022[46]	To establish the prevalence and factors associated with ABS among medical students during the COVID-19 pandemic.	Cross-sectional, prospective, and descriptive study **Population**: 613 Medical students in all semesters of a medical school in the state of Nuevo León. **Instrument**: MBI-SS. **Diagnostic criteria:** High values of emotional exhaustion, depersonalization and low values in personal accomplishment.	**Prevalence**: 54.2% of the students presented ABS. **Main findings:** Females had a higher incidence of ABS (60.2% vs 44.2%) and its components than males. The sixth-year students showed higher levels of ABS and cynicism than the other years. They found a correlation between ABS and previous diagnosis of a psychiatric disorder, substance use, and other factors.

Legend: IMSS: Instituto Mexicano del Seguro Social, ISSSTE: Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado; UNAM Universidad Autónoma Nacional de México; UMI; Undergraduate medical intern; Fac. de Med: School of Medicine; UV: Universidad Veracruzana; UANL: Universidad Autónoma de Nuevo León; E.M.M: Military Medical School

students experiencing ABS show a decline in professional integrity, with decreased values such as honesty, altruism, and empathy, and an increased tendency toward academic dishonesty, including plagiarism and cheating. ABS also affects job satisfaction, patient care, empathy, and professional conduct, increasing the likelihood of burnout during medical practice. Additionally, ABS has been linked to higher rates of suicidal ideation and thoughts of dropping out of school, as observed in various countries. These findings highlight the necessity for further investigation within the Mexican context to enhance comprehension of and strategies for addressing the challenges posed by ABS to medical students, their well-being, and their prospective professional practice.

On the other hand, given light of the elevated rates of ABS, depression, and suicidal ideation and attempts among Mexican

Medical students, and academic institutions must prioritize the identification and implementation of preventive and curricular intervention measures that promote student well-being and reduce psychological distress. Integrating intervention strategies, such as mindfulness, yoga, coping skills training, burnout education, stress, and time management, and the incorporation of wellness programs into the curriculum for future physicians is a critical issue in our country.

In recent times, there has been a notable increase in the use of mindfulness-based interventions (MBIs), stress management techniques, and small-group discussions in the field of medical education. Furthermore, studies have indicated that these strategies can reduce burnout component scores by more than 10%.[18-20,31,65] Additionally, social support or support networks have demonstrated to serve as an efficacious protective factor against burnout in medical students.[65] Despite the encouraging results observed in current interventions, further research is imperative to identify the most effective and cost-effective strategies and to ascertain how these strategies should be tailored to different educational contexts and specific student needs to ensure optimal implementation and long-term outcomes.

Currently, the accreditation standards of the Liaison Committee on Medical Education and the Accreditation Commission for Osteopathic Colleges do not explicitly consider the systemic factors that impact student well-being. To address this issue, accreditation standards that integrate wellness as a core component of medical education have been proposed. These standards include the assessment of the influence of the learning environment on student wellness, implementing continuous improvement strategies to address adverse structural factors, and incorporating evidence-based strategies into the curriculum to promote wellness.[66]

This highlights the need for school authorities in our country to implement some of the measures already developed in other countries. A 2016 national survey of 27 U.S. medical schools revealed that institutions have implemented a wide range of well-being programs to promote self-care, reduce stress, and foster social support among medical students. However, these initiatives vary in resources, infrastructure, and evaluation methods. Establishing dedicated well-being competencies and rigorously assessing their impact would help optimize the allocation of time and resources, ensuring that these strategies are effective. Strengthening evaluation efforts is crucial to reducing learner's distress and enhancing overall student well-being.[32]

A study conducted by Dyrbye et al. (2018),[33] found that 60% of the 32 medical schools in the United States include wellness activities in their curriculum. The most common wellness activities are music therapy, mindfulness, stress management and reduction techniques, animal-assisted therapy, social events (such as movie nights, art activities, board games, musical performances, and talent shows), athletic competitions, yoga, running groups, and other events.

In recent times, the Medical College of Wisconsin has developed a mandatory comprehensive curriculum with the objective of promoting student wellness and preparing first- and second-year medical students for the emotional challenges inherent to the medical profession. The curriculum, designated "REACH" (Recognize, Empathize, Enable, Care, Support Each Other), underscores the necessity of self-care as a fundamental competency alongside clinical and scientific abilities. The curriculum is based on effective approaches, including mindfulness training and the sharing of personal experiences by instructors during didactic sessions in small groups. During the initial two years of implementation (2018-2020), it was observed that 70-84% of students who have participated in the program presented an improvement in their ability to engage in self-care, mindfulness, and seeking support.[69]

This underscores the imperative for research aimed at elucidating the underlying causes of burnout and devising effective strategies within academic institutions to fortify students' emotional competencies and resilience. It is equally necessary to consider institutional policies designed to enhance academic conditions. This encompasses reducing class schedules and shift lengths, promoting flexibility, fostering a healthy learning and working environment, and improving relationships with superiors during academic training and internships. Prevention of harassment, prolonged exposure to poor teaching conditions, and excessive academic demands should also be a priority, as these factors are significant contributors to depression, anxiety, and burnout.[30]

Limitations

Several key limitations were identified in this literature review on ABS among medical students in Mexico. First, there is a lack of research focused on developing and evaluating interventions or support programs. Furthermore, discrepancies in assessment methodologies and diagnostic criteria for ABS across studies hinder comparison and synthesis of results. Some studies may also be subject to bias due to the inclusion of specific populations, such as first-semester students or undergraduate medical interns, which limits the representativeness of the findings. Additionally, the geographic heterogeneity of the studies may reflect distinctive characteristics of each region, which complicates the generalization of the results and does not provide a comprehensive national perspective.

Future research directions on Academic Burnout Syndrome among Mexican Medical Students

The analysis of the literature available on this topic in Mexico shows that there is a lack of national research examining the individual factors that may protect or predispose medical students to ABS during their training. In addition, there is a lack of longitudinal studies that examine the evolution of ABS throughout the career and its short- and long-term consequences. Research must be conducted to assess individual competencies, such as emotional intelligence and resilience, and their influence as protectors against burnout. Adaptive and maladaptive coping mechanisms that may protect or predispose students to the development of burnout should also be explored. For example, as noted above, interactions with family and friends are protective against ABS, while substance use has been linked to the development of burnout.

To investigate the influence of ABS on Mexican medical students throughout their training, it is essential to implement longitudinal studies that track their progress from the outset to the conclusion of their academic careers. Such studies should not only assess ABS levels but also correlate them with biological markers of stress, such as salivary cortisol levels, to establish a link between physiological responses, the emotional and academic impact. Furthermore, it is imperative to investigate the effects of ABS on essential competencies in medical practice, such as empathy, clinical judgment, and decision-making, utilizing clinical simulations and structured objective assessments. The association between ABS and mental health disorders, including depression and anxiety, must also be addressed, examining how these disorders affect students' academic performance and quality of life. This would facilitate the identification of critical stages in the development of burnout and its immediate and long-term consequences.

To prevent and reduce the ABS, anxiety and depression symptoms in medical students in Mexico, it is essential to implement wellness programs integrated into the curriculum. Such initiatives should include activities like music therapy,

mindfulness, yoga, stress management techniques, and social and sporting events. Furthermore, it is imperative to establish support networks and academic clubs through discussion groups and guidance, where students can share experiences, receive counsel, and access facilities dedicated to mental health care and academic stress reduction.

In addition, educational institutions and hospitals should implement strategies promoting student well-being, such as modified schedules and policies that prioritize adequate rest, prohibit psychological abuse, and allow for flexibility in extracurricular activities focused on mental health. It is imperative to ensure access to cost-effective psychological services that prioritize preventing and treating burnout. Additionally, it is crucial to implement awareness campaigns on self-care and stress management adapted to the academic and clinical context. In addition, multicenter studies with representative samples of public and private universities in different regions of Mexico are required to evaluate the prevalence of burnout, its risk factors, and the most effective interventions. This will yield a more comprehensive and generalizable understanding of the matter.

It is also crucial to implement a system for regular assessment of student well-being and to modify interventions based on the findings. Furthermore, it is advised to engage with international institutions that have effectively implemented strategies to mitigate burnout, adapting optimal practices to the requirements of the Mexican context. These interventions not only align institutions with national and international standards but also safeguard students' mental health and prepare them for the challenges of their future careers.

Conclusion

ABS poses a significant challenge to medical students worldwide, including those in Mexico, where a significant percentage of students experience its detrimental effects. Despite the existing body of research in México, much of it remains focused on descriptive studies, leaving gaps in our understanding of how to effectively prevent, treat, and raise awareness about ABS.

This review highlights the critical need for more comprehensive research that identifies the prevalence and characteristics of burnout among Mexican medical students and explores individual protective factors, such as emotional intelligence and resilience. In addition, adaptive coping mechanisms should be further explored to provide better insight into mitigating burnout. Universities must prioritize the development of preventive strategies and curricular reforms that foster a supportive and healthy learning environment, ensuring that students are equipped with the emotional and psychological tools to thrive throughout their academic journey.

The findings underscore the urgency of targeted interventions to prevent ABS and more rigorous, longitudinal studies to track the development of burnout and its long-term consequences. By addressing these gaps, academic institutions can better support the well-being of future health professionals, ultimately improving their academic success, personal health, and the quality of care they provide as physicians.

Summary – Accelerating Translation

Burnout Académico en Estudiantes de Medicina Mexicanos: Una revisión crítica su prevalencia, factores de riesgo y vacios en la intervención.

El síndrome de burnout académico (SBA) revela un preocupante estado de agotamiento y falta de compromiso entre los estudiantes de medicina. Las intensas exigencias académicas, las altas expectativas y el entorno competitivo contribuyen a su elevada prevalencia. El SBA no solo afecta al rendimiento académico, sino que también pone en peligro el bienestar y la calidad de vida general de los estudiantes de medicina en todo el mundo. En México, el SBA es una preocupación importante, con tasas de prevalencia que en algunos casos superan el 70%, superando las cifras internacionales. Aunque numerosos estudios arrojan luz sobre el tema, ciertos aspectos han sido insuficientemente explorados, lo que enfatiza la urgencia de realizar más investigaciones. Esta revisión tiene como objetivo destacar los hallazgos y avances más relevantes en la comprensión del SBA entre los estudiantes de medicina en México, identificando áreas que requieren atención inmediata.

En esta revisión, se realizó un análisis narrativo crítico tras una exhaustiva búsqueda bibliográfica de artículos tanto en inglés como en español en diversas bases de datos, como PubMed, Google Scholar, Redalyc, SciELO y DOAJ. La búsqueda se realizó en el periodo comprendido entre enero y julio de 2023. Se incluyeron en el análisis artículos de ensayos aleatorizados e investigaciones originales. Se excluyeron los metaanálisis y los estudios incompletos mientras se revisaban los artículos, lo que dio como resultado una selección final de 22 artículos relevantes.

Las investigaciones en estudiantes de medicina en México revelan amplias variaciones en las prevalencias del SBA, oscilando desde la ausencia hasta el 96%. Las prevalencias comúnmente reportadas se sitúan entre el 15% y el 35%, aunque algunos estudios registran cifras inferiores al 10% y otros superiores al 70%. Respecto al género, semestre y edad, hay hallazgos contradictorios; algunos estudios no encuentran diferencias significativas en la prevalencia del SBA, mientras que otros sugieren discrepancias de hasta el 20%. En cuanto al semestre, se observa un aumento del 7% al 36.9% en la prevalencia en semestres superiores. Además, diversos estudios indican una asociación positiva entre la mayor edad de los estudiantes y la incidencia del SBA.

Los principales factores de riesgo identificados son el semestre, el género, la edad, la sobrecarga académica/laboral, la comorbilidad con ansiedad y depresión, la relación con superiores y compañeros, la competitividad, las horas de sueño, la dificultad del programa académico, las prácticas de pregrado, el ambiente hospitalario y escolar, entre otros. Por otro lado, los factores protectores asociados a menores prevalencias del SBA son el estado civil, la personalidad resiliente, la realización de actividades como practicar deporte, tocar un instrumento y cantar.

De las escasas evidencias sobre las posibles consecuencias del desarrollo del SBA en estudiantes de medicina en México, se destaca la disminución en su capacidad para tomar decisiones acertadas, menor rendimiento académico, eficacia académica reducida, mayor propensión al cinismo, desconfianza en los conocimientos médicos adquiridos, temor al fracaso académico, preocupación por el futuro profesional, presión familiar, falta de tiempo libre, abuso de sustancias, así como el desarrollo de ansiedad y depresión.

Dadas las altas tasas de SBA entre los estudiantes de medicina mexicanos, las comunidades académicas deben identificar e implementar medidas preventivas y curriculares que promuevan el bienestar estudiantil y eviten el malestar psicológico. Lamentablemente en México se carece de

evidencias de investigaciones centradas en la evaluación de las competencias individuales, como la inteligencia emocional o la resiliencia, y su impacto en el desarrollo o la prevención del burnout, una relación que ya ha sido corroborada en investigaciones realizadas en otros países mediante la implementación de estrategias de intervención como: mindfulness, yoga, entrenamiento en habilidades de afrontamiento, educación en Burnout, manejo del estrés y del tiempo, así como la inclusión de programas de bienestar dentro del plan de estudios en la formación de los futuros médicos es un tema necesario en nuestro país.

Es imperante prestar atención a las políticas institucionales y proponer la mejora de las condiciones académicas docentes, incluyendo la reducción de los horarios de clase y duración de los turnos, la flexibilidad laboral, la búsqueda y promoción de un ambiente estudiantil y laboral saludable, así como la mejora de las relaciones con los superiores durante los estudios y en el internado de pregrado, enfatizando en evitar el acoso, la exposición prolongada a malas condiciones docentes y las excesivas exigencias académicas que pueden conducir al desarrollo de problemas de salud mental.

En resumen, la mayoría de los estudios en México se han centrado en cuantificar la magnitud del SBA, pero se necesitan investigaciones más profundas que identifiquen los factores de riesgo y protección específicos del contexto mexicano. Además, la falta de estudios que desarrollen e implementen estrategias de intervención para prevenir o reducir la prevalencia del SBA en esta población es evidente.

Este trabajo es crucial para comprender la problemática actual en México y, al mismo tiempo, constituye un llamado a fomentar la colaboración entre los sectores académico y hospitalario para crear un entorno más saludable. Se busca mejorar la satisfacción, el bienestar y la salud mental, contribuyendo a una formación médica de alta calidad mediante estrategias centradas en la prevención, sensibilización y tratamiento de los problemas de salud mental durante la educación médica. Estas estrategias abordan tanto las presiones académicas como el desarrollo de habilidades de inteligencia emocional, subrayando la necesidad de un enfoque integral y multidimensional.

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Case Report

Hydatid Cyst Complicated by Dilated Bile Duct Treated with Endoscopic Retrograde Cholangiopancreatography (ERCP): A Case Report

Ahmad Hmaideh,[1] Badraie Haji,[2] Faeyz F. Orabi,[3] Osamah Almostaffa,[2] Qusai Rashwany,[2] Wasim Zakaria.[4]

Abstract

Background: Echinococcosis, primarily caused by Echinococcus granulosus, frequently leads to the formation of hydatid cysts in various organs, particularly the liver and lungs. In rare instances, these cysts can rupture into the biliary tract, resulting in complications such as dilation of the Common Bile Duct (CBD) and obstructive jaundice. This study aims to document a rare case of CBD dilation due to the rupture of a hydatid cyst, highlighting the need for tailored diagnostic and therapeutic approaches for this unusual presentation. **The Case:** A 37-year-old male patient presented with abdominal pain, anorexia, and jaundice. Abdominal ultrasonography and computed tomography (CT) scans identified multiple hydatid cysts in the liver, with one ruptured cyst extending into the CBD. An endoscopic retrograde cholangiopancreatography (ERCP) was performed to remove the hydatid cyst membranes, followed by the placement of a stent and irrigation of the biliary ducts. Surgical excision of remaining liver cysts was subsequently conducted. The use of ERCP allowed effective removal of cystic material from the biliary tract, reducing CBD obstruction and alleviating jaundice symptoms. Surgical intervention further ensured the complete removal of hydatid cysts. **Conclusion:** This case highlights that Endoscopic Retrograde Cholangiopancreatography (ERCP) is an effective diagnostic and therapeutic tool for managing biliary complications associated with hydatid disease, particularly the dilation of the Common Bile Duct (CBD). The combination of ERCP with surgical intervention resulted in optimal outcomes for this patient, who presented an uncommon manifestation of echinococcosis.

Introduction

According to studies, the average diameter of the common bile duct (CBD) ranges between 4 and 8 mm, with diameters greater than 7 mm considered abnormal.[1] The prevalence of dilated common bile duct attributable to a hydatid cyst membrane is relatively rare, with limited comprehensive epidemiological data available in the existing literature. Cases of this condition have been documented at a low rate, often presenting as an uncommon complication of hepatic hydatid disease. Notably, approximately 80-90% of patients exhibit fistulae between the biliary system and the hepatic cyst (LHC). Furthermore, significant intrabiliary rupture is reported to occur in 5-17% of patients.[2]

Biliary obstruction can result from any condition that prevents bile flow from the biliary system into the duodenum, such as choledocholithiasis, extrinsic compression (as in cholangiocarcinoma, pancreatic head masses, or papillary tumors), parasitic infections, dysfunction of the sphincter of Oddi, and papillary stenosis, among others.[3] While many factors can cause biliary obstruction, CBD obstruction due to hydatid cyst membranes is considered a rare cause. Intra biliary rupture of hepatic hydatid cysts was first described in the 1860s.[4] These cysts are typically acquired through the ingestion of Echinococcus granulosus eggs, which are commonly found in the feces of infected dogs.[5] Preventative measures include regular deworming of pet dogs and maintaining good hygiene practices, especially thorough handwashing.

Highlights:

- This case report documents a rare instance of biliary ductal dilation resulting from hydatid cysts, a condition that is under-discussed in current medical literature.
- It emphasizes the diagnostic complexities associated with biliary complications of hydatid cysts, highlighting the importance of advanced imaging and precise differential diagnosis.
- The report underscores the need for a multidisciplinary approach, involving gastroenterology, infectious disease, and surgery specialists, to achieve optimal patient outcomes.
- This case demonstrates the effective use of minimally invasive endoscopic techniques, combined with antiparasitic therapy, as a treatment strategy for biliary obstruction caused by hydatid cysts.
- This study aims to raise awareness of the importance of early intervention and regular follow-up to prevent long-term complications, especially in endemic regions.

[1] MD. Alrahma Hospital/Institution,SPHN, Idlib, Syria.
[2] MD. Alrahma Hospital/Institution, Idlib, Syria.
[3] MD. PMR, SBOMS, Idlib, Syria.
[4] MD. Internal Medicine, SBOMS, Idlib, Syria.

Correspondence:
Ahmad Hamideh.
Address: Darkush, Idlib Governorate, Syria.
Email: ahmadhmededoctor@gmail.com

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Treatment options vary depending on the size, location, and presence of complications associated with the cyst. Recent studies indicate that combining surgery or Percutaneous Aspiration, Injection, and Reaspiration (PAIR) with chemotherapy using benzimidazole drugs—either before or after the surgical procedure—leads to better treatment outcomes. A meta-analysis showed that the odds ratio for these combined treatments is 48 (95% CI: 4–586).[6] With appropriate healthcare, recovery is achievable.

Ultrasonography is the imaging technique of choice for evaluating a dilated common bile duct (CBD).[5] Symptoms of CBD dilation may include pain or discomfort in the upper abdomen, jaundice, anorexia, and elevated serum bilirubin levels.[7] Endoscopic retrograde cholangiopancreatography (ERCP) is utilized for the removal of cyst membranes. Despite the fact that the primary indication for ERCP is choledocholithiasis,[8] it was the only option available in our country for extracting the cyst membranes.

The present study aims to report a rare case of dilated common bile duct caused by a hydatid cyst membrane, which was treated using endoscopic retrograde cholangiopancreatography.[8] Written informed consent was obtained from the patient for the publication of this case report and any accompanying images, ensuring the confidentiality and privacy of the patient's identity and details.

Informed consent for publication was obtained from the patient. This case was documented in 2023 at ARRAHMA Hospital in northwest Syria.

The Case

A 37-year-old man was admitted to the hospital with symptoms of abdominal pain, vomiting, and anorexia for 15 days. He denied any previous medical conditions, surgical history, or substance abuse. The patient reported intermittent fevers, but no cough. He experienced colicky abdominal pain that began a week ago and progressively worsened throughout the week. This was accompanied by nausea, vomiting, fatigue, and a general feeling of malaise. His occupational history included exposure to animals, particularly livestock, which is noteworthy considering the potential zoonotic nature of his condition. Additionally, his dietary history revealed the consumption of undercooked meat, and the patient did not report any changes in the color of his urine or stool.

Upon examination in the emergency department, his vital signs were as follows: blood pressure of 125/85 mmHg, oxygen saturation of 98%, pulse of 95 bpm, and a fever of 38°C.

The physical examination revealed scleral icterus and epigastric abdominal tenderness radiating to the back, with no visible surgical scars. The abdominal ultrasonography showed multiple hydatid cysts within the liver parenchyma, some extending into the common bile duct (CBD) with a maximum diameter of 16 mm. Ultrasound serves as a vital diagnostic tool for detecting hydatid cysts, which identifies real-time visualization of their morphology, size, and topographic relationships, which is crucial for evaluating the extent of the disease. Moreover, it is non-invasive, widely accessible, and aids in distinguishing hydatid cysts from other hepatic lesions, enabling early diagnosis and facilitating treatment planning.

The patient underwent upper abdominal computed tomography (CT) imaging, which revealed a hydatid cyst spanning seven liver segments, along with a hyperechoic density within the common bile duct (CBD), indicative of a ruptured cyst ***(Figures 1, 2).*** The hyperechoic density within the CBD, measuring 12.2 mm, likely represents a ruptured hydatid cyst with biliary communication -a known complication of hepatic hydatidosis with significant clinical implications.

The laboratory tests, as shown in ***Table 1,*** revealed elevated total bilirubin levels, particularly direct bilirubin, which suggests an obstructive etiology, likely due to hydatid cysts lodged within the common bile duct (CBD). The elevated inflammatory markers further support the presence of an underlying inflammatory process, which may result from cyst complications such as infection or cholangitis. Additionally, liver function tests were mildly elevated, indicating impaired hepatic function often associated with biliary obstruction.

In this context, the combination of elevated direct bilirubin, inflammatory markers, and disturbed liver function strongly suggests that intervention is necessary to relieve the obstruction and manage potential complications. Based on these laboratory findings, the decision was made to proceed with endoscopic retrograde cholangiopancreatography (ERCP) to visualize the biliary tree, confirm the diagnosis, and manage the obstruction.

Cystic membranes were identified through the sphincter of Oddi papilla, prompting deep selective cannulation. The injection of contrast medium confirmed a dilated common bile duct (CBD), and a sphincterotomy was performed on the major papilla ***(Figure 3).*** A stone extraction balloon was passed several times to remove the cystic membranes. During the ERCP, a plastic curved stent was inserted into the CBD to facilitate bile drainage and prevent obstruction ***(Figure 4).***

The plastic stent was chosen for its flexibility and effectiveness in maintaining patency within the biliary system, while allowing for easy removal post-cystectomy. This approach helps minimize the risk of re-obstruction by accommodating the natural curvature of the bile duct.

Physiological saline was injected to clear any remaining cyst fragments and inflammatory secretions. Post-procedure follow-up included monitoring of laboratory tests, particularly liver function and bilirubin levels, to assess the effectiveness of the

intervention and ensure the resolution of any obstruction-related issues.

After the procedure, laboratory tests showed significant improvement, and the patient exhibited no signs of abdominal pain, fever, or jaundice *(Table 2).* An oral antiparasitic medication, albendazole 400 mg twice a day, was initiated to address any residual parasitic infection and prevent recurrence, with close monitoring of liver function.

The patient was advised to follow up with a gastroenterologist for stent removal after the cystectomy to mitigate the risk of recurrent obstruction.

Table 1. Laboratory Investigations of the Case.

Test	Observed Value	Reference Range
WBC	10 x 10 3 /µL	4.0-11.0 x 10 3 /µL
CRP	55	UP TO 6
Direct bilirubin	5.1	0.0-0.3 mg/dL
Indirect bilirubin	2	0.1-0.7 mg/dL
ALT	162	7-56 U/L
AST	88	5-40 U/L
PT	17	10.0-14.0 seconds
INR	1.3	0.8-1.2
APTT	40	25-35 seconds
ALP	900 U/L	44-147 U/L

Table 2. The Laboratories Tests After Operation.

Test	Observed Value	Reference Range
WBC	5 x 10 3 /µL	4.0-11.0 x 10 3 /µL
CRP	17	UP TO 6
Direct bilirubin	1.3	0.0-0.3 mg/dL
Indirect bilirubin	1	0.1-0.7 mg/dL
ALT	66	7-56 U/L
PT	16	10.0-14.0 seconds
INR	1.1	0.8-1.2
ALP	350 U/L	44-147 U/L
APTT	35	25-35 seconds
AST	70	5-40 U/L

Figure 1. Abdominal CT-Scan Showing A Hepatic Hydatid Cyst Of Segment Vii.

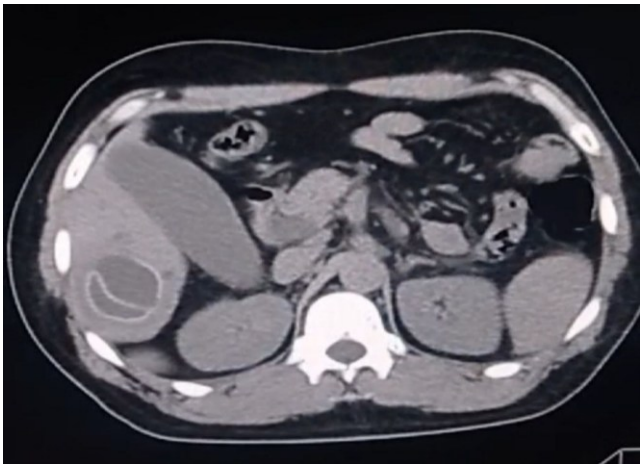

Figure 2. A Ruptured Cyst Within CBD.

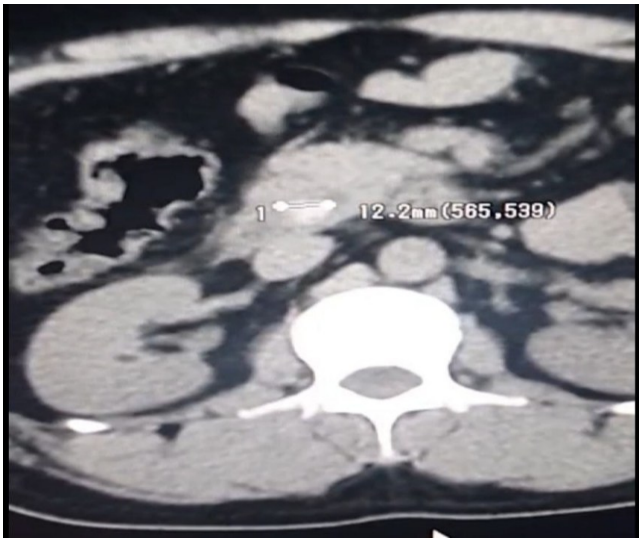

Figure 3. Sphincterotomy of the Hepatic Hydatid Cyst.

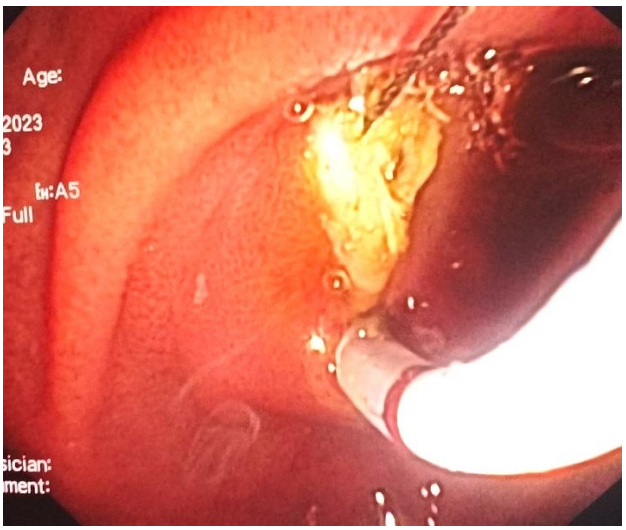

Figure 4. Extraction Parts of Cyst Through Ampulla by Stone Extraction Balloon.

Discussion

Echinococcosis, a zoonotic disease, is prevalent in regions with significant agricultural and cattle production, including the Mediterranean, Southwest, Latin America, the Middle East, China, and Africa.[9] Common complications of this disease include rupture and superinfection, with rupture occurring in 50–90% of cases, typically due to the progressive maturation of the cyst.[10] In our case, rupture occurred within the biliary tracts, leading to dilation of the CBD and the onset of jaundice. This represents a rare complication of hydatid cysts; communicating rupture within the biliary tree is more likely to occur in the central liver segments, particularly in large cysts (up to 80% of hepatic hydatid cysts larger than 7.5 cm) and in advanced stages of the disease.[11]

The spectrum of symptoms varies based on the organs involved, the size and position of the cysts within the affected organs or tissues, and the interactions of the growing cysts with adjacent structures. The patient presented with abdominal discomfort in the epigastric region, anorexia, and the development of jaundice, all of which indicate complications related to the hydatid cyst.[12]

The diagnosis of echinococcosis relies on clinical features, laboratory tests, and radiographic investigations, including ultrasonography, computed tomography (CT), and confirmation through immunodiagnostic testing to detect specific antibodies in the blood.[13] In our case, we utilized ultrasound as the initial evaluation method, which revealed hydatid cysts and a dilated CBD. Subsequently, we chose CT for diagnostic confirmation, which indicated the presence of a ruptured cyst within the CBD ***(Figure 1).***

Abdominal ultrasonography effectively visualized the characteristic cystic structures in the liver and assessed their extension into the CBD, contributing to a comprehensive evaluation of the disease's extent and guiding subsequent management decisions. Furthermore, CT imaging offers precise visualization of the biliary system, facilitating an accurate assessment of CBD dilation. It also enables the identification of key characteristics of the hydatid cyst membrane, including size, location, and morphology, which are crucial for selecting optimal treatment strategies.[14] Magnetic resonance cholangiopancreatography (MRCP) is significant for its ability to visualize the biliary tree without the need for ionizing radiation or contrast injection, making it an ideal choice for patients with suspected biliary complications. MRCP can accurately delineate the anatomy and identify obstructions, providing crucial information for management.[15] Due to limitations in our local healthcare infrastructure, we primarily rely on available modalities such as ultrasound and CT, which are essential for diagnosing and managing hydatid cyst complications. Unfortunately, despite MRCP being a powerful non-invasive tool for evaluating biliary obstruction with its detailed imaging capabilities, is unavailable in our region.

The optimal treatment for this case involved the removal of the ruptured cyst through ERCP, which is now the primary diagnostic and therapeutic approach for primary hydatid cysts in the biliary tree.[16] A balloon and basket catheter were employed to extract a significant portion of the membranes and daughter capsules from the CBD, following an endoscopic sphincterotomy. After emptying the hydatid membranes and large daughter cysts, the CBD was irrigated with saline to wash out the smaller daughter cysts and hydatid fragments. The day after the procedure, the patient's condition improved significantly, and laboratory tests showed marked improvement, approaching normal levels.

The importance of performing ERCP when there is uncertainty regarding cysto-biliary communication has been emphasized. This approach is supported by Bayrak and Altıntas (2019), who advocate for preoperative ERCP in cases involving elevated liver enzymes, cholangitis, and biliary duct dilation.[17] Such recommendations align with established guidelines that endorse ERCP for clarifying biliary anatomy and effectively managing complications. Notably, preoperative ERCP has proven successful in over 80% of cases for endoscopic sphincterotomy and the removal of biliary daughter vesicles. ERCP alone can sometimes cure patients without the need for surgery, as evidenced in approximately 25% of cases in various studies.[18]

Open surgery, including partial cystectomy, has traditionally been the treatment for hydatid cysts with biliary complications, particularly in cases with large biliocystic fistulas. However, it carries a morbidity risk of around 20%, with specific complications such as biliary fistulas and infections occurring in approximately 16% of cases. The mortality rate associated with this surgery is around 1.5%. Factors like large cyst size, location in the liver dome, and cystobiliary fistulas increase the likelihood of complications. The choice between radical and conservative approaches significantly affects both morbidity and mortality outcomes.[19]

Laparoscopic surgery, while less invasive, is typically reserved for patients with accessible cysts (type I-III) and has been shown to result in lower recurrence and morbidity rates compared to open surgery. A 10-year retrospective study reported a 3.3% recurrence rate and fewer complications, such as biliary leakage, for laparoscopic procedures, making it a safer and effective option

for selected cases of hepatic hydatid disease.[17,18,20] After the successful ERCP, oral antiparasitic medications such as albendazole or mebendazole should be initiated to address any residual parasitic infection and to prevent recurrence.[21] These medications inhibit the parasite's ability to absorb glucose, eventually causing its death. The dosing, duration, and potential side effects of these medications should be discussed based on the patient's liver function and response to treatment. Regular monitoring of liver enzymes is crucial during treatment with albendazole due to its potential hepatotoxicity.[22]

Regular follow-up imaging, such as ultrasound or CT scans, is crucial for monitoring cyst recurrence and identifying potential obstructions. Liver function tests should also be assessed to facilitate the early detection of biliary complications.

Routine imaging, including ultrasound or MRI, is recommended to evaluate for residual cysts, particularly in the liver and bile ducts. Serial abdominal ultrasounds and liver function assessments can help track treatment effectiveness and detect complications, such as bile duct obstruction or infection, at an early stage. Surgical intervention may be indicated in the following scenarios:

- Residual Cysts: if cysts persist after ERCP or if oral medications do not effectively resolve the hydatid cysts, surgical removal or percutaneous drainage may be necessary.
- Liver Abscess or Infection: infection of the cysts, known as suppuration, may require prompt surgical intervention, which can be performed laparoscopically or through open surgery.
- Large Cysts: cysts that are too large for ERCP treatment alone or that carry a significant risk of rupture may necessitate surgical intervention to prevent further complications.

Educating patients about warning signs, such as jaundice and abdominal pain, is essential for ensuring timely intervention. By establishing a comprehensive follow-up care plan, we can improve patient outcomes and proactively address potential complications.

Conclusion

The presented case highlights the importance of considering hydatid cysts as a potential cause of a dilated common bile duct. The successful management of this condition using ERCP demonstrates the efficacy of minimally invasive procedures in treating such cases. ERCP allows direct access to the biliary system, facilitating the removal of hydatid cyst membranes or obstructive debris. As a minimally invasive technique, ERCP provides a safer alternative to surgical interventions for complications arising from biliary dilation due to hydatid cyst membranes, resulting in reduced surgical risks and expedited postoperative recovery.[16] Moreover, ERCP not only effectively addresses these complications but also minimizes patient morbidity and promotes quick recovery.

By highlighting this approach, we advocate for its implementation in similar contexts, ultimately enhancing patient outcomes in challenging healthcare environments. It is also crucial to emphasize the significance of a multidisciplinary approach that encompasses clinical suspicion, appropriate imaging modalities, and timely intervention to achieve optimal patient outcomes in cases of dilated common bile duct secondary to hydatid cyst membranes.

Summary – Accelerating Translation

Echinococcosis, a parasitic infection, manifests as the development of hydatid cysts in various organs, including the liver and lungs, leading to multiple complications such as cyst rupture and subsequent infection. This study presents a rare case of obstructive jaundice caused by the rupture of a hydatid cyst into the biliary system, resulting in common bile duct dilation. A 37-year-old male presented with symptoms of abdominal pain, anorexia, and jaundice.

Ultrasound and Computed Tomography (CT scan) confirmed the diagnosis, then Endoscopic Retrograde Cholangiopancreatography (ERCP) was performed to remove hydatid cyst membranes, insert a stent, and irrigate the biliary system with saline. Followed by surgical intervention to remove the remaining hydatid cysts. Although ERCP is primarily used for diagnostic and therapeutic purposes in evaluating a dilated common bile duct (CBD), this case demonstrated its successful application in treating hydatid cyst rupture, a rare occurrence.

This case emphasizes the importance of considering hydatid cysts as a potential cause of a dilated CBD. The successful management using ERCP underscores the value of minimally invasive procedures in treating such cases. A multidisciplinary approach, involving clinical suspicion, imaging modalities, and timely intervention, is essential for optimal patient outcomes when managing CBD dilation due to hydatid cyst rupture.

حالة توسع القناة الصفراوية بسبب كيسة مائية

مقدمة

تعتبر القناة الصفراوية المشتركة جزءاً أساسياً من الجهاز الهضمي، حيث تنقل الصفراء من الكبد إلى الأمعاء لتسهيل هضم الدهون. قد يحدث في بعض الحالات، توسع غير طبيعي في القناة، مما يشير إلى وجود مشكلة طبية قد تكون خطيرة. إحدى الأسباب المحتملة لتوسع القناة هي **الكيسات المائية**، وهي أكياس تكون مملوءة بالسائل وتتكون نتيجة عدوى طفيلية.

ما هي الكيسات المائية؟

الكيسات المائية هي أكياس تحتوي على سائل، و تنجم غالباً عن العدوى بطفيلي يُعرف باسم **المشوكة الحبيبية**، ومصدره عادة من الكلاب وبعض الحيوانات الأخرى. يمكن أن تتشكل الكيسات في الكبد أو الأعضاء الأخرى عندما يتعرض الإنسان لهذا الطفيلي، مما يؤدي إلى الضغط على الأنسجة المحيطة، بما في ذلك القناة الصفراوية.

توسع القناة الصفراوية المشتركة

يُعرَّف توسع القناة المشتركة بأنه زيادة غير طبيعية في قطر القناة، وغالباً ما يكون ناتجاً عن انسداد أو انضغاط من بنى مجاورة. يتراوح قطر القناة الصفراوية الطبيعية بين 4 إلى 8 مم، وأي زيادة في هذا القياس يشير إلى مشكلة طبية.

الأعراض والعلامات السريرية

تشمل الأعراض المرتبطة بتوسع القناة الصفراوية:

الرعاية الداعمة: تشمل الرعاية الداعمة التحكم في الأعراض، مثل تخفيف الألم، ومراقبة اليرقان والغثيان، مع إمكانية تعديل النظام الغذائي.

المتابعة والمراقبة: يجب على المريض بعد الإجراءات العلاجية المطبقة له، الخضوع لفحوصات دورية لمراقبة حالة القناة الصفراوية والتأكد من عدم عودة الكيسات أو حدوث مضاعفات. وتشمل التصوير بالموجات فوق الصوتية أو التصوير المقطعي المحوسب لتقييم حالة الكيسة والوظائف الصفراوية.

الوقاية: تشمل الوقاية زيادة الوعي حول المخاطر المرتبطة بالكيسات المائية والعدوى الطفيلية، مع التأكيد على أهمية النظافة الشخصية وتجنب تناول الطعام غير المطبوخ جيدًا.

الحالة السريرية:

هدف الدراسة:

تهدف هذه الدراسة إلى توثيق حالة نادرة لتوسع القناة الصفراوية المشتركة بسبب تمزق أحد الكيسات المائية ضمن القناة ومنع مرور الصفراء، مع تسليط الضوء على الحاجة إلى مقاربات تشخيصية وعلاجية مخصصة لهذه الحالة الغير العادية.

الحالة السريرية:

راجعنا مريض ذكر يبلغ من العمر 37 عامًا بشكوى من ألم في البطن، وفقدان الشهية، واليرقان. أظهرت الفحوصات بالموجات فوق الصوتية للبطن والتصوير المقطعي المحوسب (CT) وجود عدة أكياس مائية في الكبد، مع كيس واحد ممزق إلى القناة الصفراوية المشتركة (CBD). تم إجراء **تنظير راجع للطرق الصفراوية والبنكرياسية** (ERCP) لإزالة أغشية الكيسة المائية، ثم تم بعد ذلك وضع دعامة وغسل القنوات الصفراوية. وبعد ذلك تم إجراء استئصال جراحي للأكياس المتبقية في الكبد.

النتائج:

سمح استخدام ERCP بإزالة فعالة للكيسة ومحتوياتها من القناة الصفراوية، مما قلل من انسداد القناة الصفراوية المشتركة وخفف من أعراض اليرقان. كما ضمنت التدخلات الجراحية الإزالة الكاملة للأكياس المائية

الاستنتاج:

تسلط هذه الحالة الضوء على أن **التنظير الراجع للطرق الصفراوية والبنكرياسية** (ERCP)هو أداة تشخيصية وعلاجية فعالة لإدارة المضاعفات الصفراوية المرتبطة بمرض الكيسات المائية ، لا سيما توسع القناة الصفراوية المشتركة (CBD) . أسفر إجراء التنظير الراجع للطرق الصفراوية والبنكرياسية (ERCP) مع التدخل الجراحي عن نتائج مثالية عند هذا المريض.

الخاتمة

تمثل حالة توسع القناة الصفراوية المشتركة بسبب كيسة مائية تحدياً طبياً، لكن من خلال الفهم الجيد للأعراض، وطرق التشخيص، والعلاج المتاحة، يمكن تحقيق نتائج إيجابية. استخدام التقنيات الحديثة مثل التنظير الراجع للطرق الصفراوية يُظهر كيف يمكن معالجة هذه الحالات بشكل فعال، مما يحسن من نوعية الحياة للمرضى.

- **ألم في الجزء العلوي الأيمن من البطن:** قد يكون هذا الألم مزمناً أو متقطعاً، ويمكن أن يترافق مع تناول الأطعمة الغنية بالدهون.
- **غثيان وإقياء:** قد تكون هذه الأعراض متكررة، خاصة بعد تناول الطعام.
- **اصفرار الجلد والعينين (اليرقان):** يحدث بسبب ارتفاع مستويات البيليروبين في الدم نتيجة انسداد القناة الصفراوية.
- **فقدان الشهية:** مما قد يؤدي إلى فقدان الوزن.
- **حمى**: قد تظهر في حالة وجود عدوى مرتبطة.

التشخيص

يتم استخدام عدة تقنيات لتشخيص حالة توسع القناة الصفراوية المشتركة الناجم عن كيسة مائية، منها:

- **الفحص السريري:** يبدأ الطبيب بفحص المريض لتقييم الأعراض والعلامات السريرية. يتم قياس درجة الحرارة، وضغط الدم، وفحص البطن للبحث عن علامات الألم أو الانتفاخ.
- **التصوير بالموجات فوق الصوتية (Ultrasound):** تُعتبر هذه التقنية من أوائل الخطوات في تشخيص الكيسات. تُستخدم الموجات فوق الصوتية لإظهار الكيسات في الكبد أو الأعضاء المجاورة، وتساعد في تقييم حجمها وموقعها.
- **التصوير المقطعي المحوسب (CT Scan):** يُعتبر الفحص بالتصوير المقطعي المحوسب أكثر دقة في تحديد حجم الكيسات وموقعها، كما يوفر معلومات عن التأثيرات المحتملة على الأعضاء الأخرى.
- **التصوير بالرنين المغناطيسي (MRI):** يُستخدم عندما يكون هناك حاجة لمزيد من التفاصيل حول الأنسجة المحيطة، خاصة عند الشك في وجود مضاعفات.
- **تحليل الدم:** يُمكن أن تشير التحاليل المخبرية إلى وجود عدوى أو التهابات، بما في ذلك فحص مستويات البيليروبين، ووظائف الكبد.
- التدابير العلاجية:

تتطلب حالة توسع القناة الصفراوية المشتركة الناجم عن الكيسات المائية تدابير علاجية دقيقة، تعتمد على حجم الكيسة، وموقعها، والأعراض التي يعاني منها المريض. أهم التدابير العلاجية الرئيسية لهذه الحالة:

التنظير الراجع للطرق الصفراوية والبنكرياسية (ERCP): يُستخدم لتشخيص وعلاج توسيع القناة الصفراوية. يتم إدخال أنبوب مرن مزود بكاميرا لتحديد موقع الكيسة أو الانسداد، مع إمكانية إزالة الكيسة أو وضع دعامة لتحسين تدفق الصفراء، يمكن القيام بذلك أثناء هذا الإجراء.

الجراحة: في الحالات التي تكون فيها الكيسات كبيرة أو تسبب مضاعفات، قد تكون الجراحة المفتوحة أو بالمنظار ضرورية لإزالة الكيسة بالكامل.

العلاج الدوائي: يشمل العلاج بالمضادات الحيوية، في حالة وجود عدوى مصاحبة، يمكن وصف مضادات حيوية لعلاج العدوى. و**العلاج المضاد للطفيليات**، في حالة الإصابة بالطفيليات (مثل **داء الكيسات المائية**)، يُمكن استخدام أدوية مثل الألبيندازول أو الميبندازول.

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Conflict of Interest Statement & Funding

the authors assert that there are no conflicts of interest pertaining to this study. No author possesses any financial, personal, or professional relationships that could potentially influence the outcomes or interpretations of the research.

Author Contributions

Ahmad Hmaideh, MD, the first author and corresponding author, is currently affiliated with Al-Rahma Hospital in Idlib, Syria, is a resident at the Syrian Board of Medical Specialties and is actively involved in the Syrian Public Health Network.

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Experience

Public Health Longitudinal Integrated Foundation Training (LIFT) Program: A Junior Doctor's Experience

Dawn Celine Siaw Chern Poh,[1] Sarah Andrews, [2] Ushan Andrady. [3]

The Experience

Public health encompasses health improvement, health protection, and healthcare services. It adopts a population-centric approach to address social determinants of health and create equitable societies. The Betsi Cadwaladr University Health Board is the local health board responsible for serving North Wales. Public Health Wales is a national agency of the NHS Wales established in 2009 as part of a major restructuring of the health service in Wales. The health board works closely with PHW to implement and operationalize public health initiatives tailored to the needs of communities regionally.

I participated in a one-year public health Longitudinal Integrated Foundation Training (LIFT) program at Betsi Cadwaladr University Health Board. This program is introduced by Health Education and Improvement Wales and typically comprises general practice (GP) placements that aims to expose trainees to primary care. The new non-GP LIFT in public health offers a broader and more varied exposure to preventative medicine which is often overlooked in the traditional undergraduate medical school curriculum. In the context of this paper, I pursued the public health LIFT to develop a broader understanding into addressing systemic issues to prevent end-stage disease complications with strategic solutions through an upstream approach.
This paper provides an overview of key reflections drawn from a range of public health experiences which addresses family health, environmental, and regulatory compliance issues during a public health LIFT as a junior doctor.

Work in the Public Health LIFT

Preconception Care Draft Strategy: The North Wales Preconception Task and Finish group draft strategy provided valuable insights into the implementation of preconception care. As part of this process, I had the opportunity to contribute additional perspectives related to NHS national screening programs, vaccination uptake (such as Human Papilloma Virus and Hepatitis B), and addressing anemia through nutritional supplementation. The Lancet series (2018) reflects this approach to preconception care, emphasizing how preconception health can impact future health and outlining steps to improve health before pregnancy as illustrated in Figure 1.1,2 Public health efforts can significantly improve maternal and child health outcomes by targeting women with the greatest preconception health needs, which helps address the principles of inverse care law as described by Hart in 1971.3 This experience has strengthened my understanding of the critical role draft strategies play in the policymaking process to strategically drive societal change.

Consultation to decommissioning a nuclear power plant station: Shadowing a consultation regarding the decommissioning of a nuclear power station both as the representatives from the health board, I recognized the complexities in the nuclear-related discourse. The consultation involved discussions among various stakeholders, including local residents and volunteers from healthcare and social work sectors, regarding the historical background of the site and the ongoing decommissioning process. While the discussions relatively addressed most of the concerns foreseen, I noticed one predominant challenge was the use of scientific jargon in presentations, which may have presented difficulties for laymen to fully engage with the information relayed. This consultation was a valuable learning experience as it highlights the importance of plain language in consultation presentations in enhancing public engagement throughout the decision-making process. It will be crucial to bridge the gap between accessibility, technical expertise and needs of the local community to ensure that final decisions are representative of the health-specific concerns of individuals directly affected by the changes in local environmental health policies.

[1] MBBS, MRes. Ysbyty Gwynedd, Betsi Cadwaladr University Health Board, Wales, United Kingdom.

[2] MPH. Ysbyty Gwynedd, Betsi Cadwaladr University Health Board, Wales, United Kingdom.

[3] MBBS. Ysbyty Gwynedd, Betsi Cadwaladr University Health Board, Wales, United Kingdom.

About the Author: *Dr Poh is a medical graduate, and she completed the Public Health Longitudinal Integrated Foundation Training (LIFT) program as a foundation trainee at Ysbyty Gwynedd (Bangor Hospital) in NHS Wales, United Kingdom. She was the recipient of the NIHR Newcastle Biomedical Science Studentship Award to intercalate for a Master of Research (Cancer) in Newcastle University. She is currently a Research Fellow at Program in Global Surgery and Social Change (PGSSC) at Harvard Medical School.*

Correspondence:

Dawn Celine Siaw Chern Poh

Address: Penrhosgarnedd, Bangor, Gwynedd, LL57 2PW, Wales, United Kingdom.

Email: dawn.poh@outlook.com]

Editor: Francisco J. Bonilla-Escobar
Student Editors: Rola Mohareb, Dzhaner Bashchobanov
Copyeditor: Adnan Mujanovic
Proofreader: Amy Phelan
Layout Editor: Daniela Collazos

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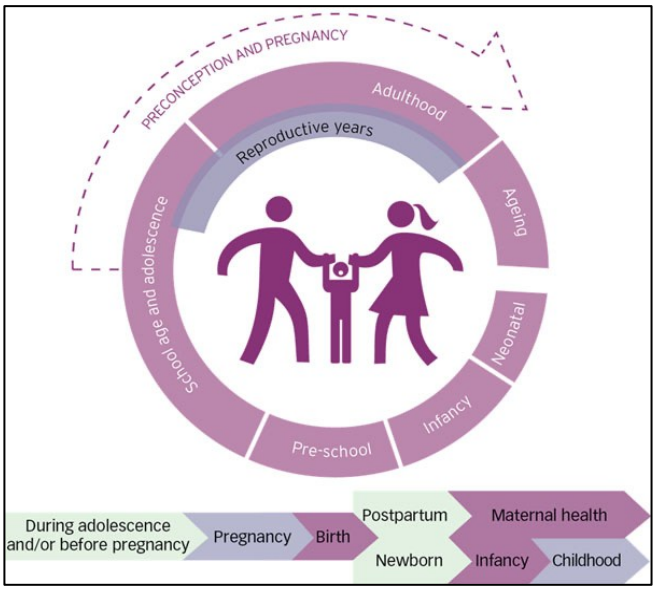
Meeting on Cryptosporidium Outbreak: The interdisciplinary meeting involved reporting the coordinated response to the Cryptosporidium outbreak linked to a local swimming pool. The discussions highlighted the importance of vigilant water filtration and pool treatment monitoring, as well as the necessity of interdisciplinary cooperation between environmental health, health protection, and other local health agencies. Reviewing outbreak control plans regularly demonstrated the importance of adhering to established communicable disease surveillance protocols to control an outbreak. This meeting helped me appreciate the multi-agency expertise in protecting communities against communicable disease outbreaks through a systematic and proactive response, underpinned by epidemiological principles such as the Bradford Hill criteria.[4]

The new Wales-wide 20-mph speed limit law: My first-hand witness of the implementation of Wales' 20mph speed limit law passed in July 2022 highlights the importance of synergy between researchers and policymakers. This pioneering legislation aims to make streets safer and inspire other nations. Research by public health practitioners and Edinburgh Napier University suggests it could reduce collisions by 40%, preventing 6-10 fatalities and 1,200-2,000 injuries annually. This collaboration between research findings and policy decisions has led to a significant change prioritizing community safety and wellbeing.

Figure 1. Preconception Car.



Challenges in this placement:

1. One of the key challenges in this placement is managing primary clinical responsibilities and core teaching requirements alongside the unique learning opportunities in LIFT. Proactive planning and coordination are essential to leverage the benefits of the program.
2. The scope of work in public health is also significantly different from routine clinical practice, requiring a period of transition to the complex network of health policies and political agendas involved. Hence, dedicating focused effort to expand knowledge in the field is essential.

Conclusions

An exposure to a diverse range of public health issues along with ongoing projects in the field —including family health, environmental concerns, and regulatory matters—, has deepened my appreciation for senior professionals. These dedicated individuals work tirelessly behind the scenes to drive changes that improve the health and welfare of the population.

With rising chronic diseases, integrating knowledge in public health into medical training is crucial. I strongly encourage junior doctors to embrace public health training, as it offers new perspectives on complex health issues through identifying practical guidelines, conducting quality improvement projects, and potentially helps develop new skills through sharing learning experiences and teaching.

Permissions and conflict of interest : I worked as a foundation trainee in Ysbyty Gwynedd (Bangor Hospital) and declare no other competing interests. Permission for publication has also been obtained from Dr. Ushan Andrady, Foundation Program Director, Betsi Cadwaladr University Health Board NHS Wales.

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Author Contributions

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Experience

Collaborative Institutional Training Initiative (CITI): Student Experience

Lillian F. Nguyen,[1] Mark A. Hirsch.[2]

The Experience

Completion of human subjects ethics training is mandatory for researchers. The Good Clinical Practice (GCP) and Basic Human Subjects Research (HSR) Collaborative Institutional Training Initiative (CITI Training) is the gold standard of human subject ethics training via completion of mandatory webinar modules and is used by over 1,500 institutions globally.[1] Completion of CITI Training is an important step in a researcher's training, allowing the researcher to fully comprehend the historical bioethical perspective and regulatory parameters required to perform ethical research.

The CITI Training Program offers two formats: audio-visual and classic. The content presentation differs based on several factors. The CITI Program website differentiates the formats as "largely a matter of personal taste."[3] While an audio-visual option might present as more engaging to a learner, both versions still have long texts. The audio-visual format does split the paper into a slideshow format, although retaining the verbatim content.
CITI Training is targeted to institutional review board members, clinical research coordinators, research staff, principal investigators, and college students.[1] Historically, inexperienced student research learners including highschool, undergraduate, and/or medical students are not involved in providing feedback on research ethics training.

Current challenges facing highschool students during the completion of CITI Training include that research ethics is not part of a normal highschool curriculum in the USA and that highschool students do not regularly conduct human subjects biomedical research. Current challenges medical students face when completing CITI Training include the training is often viewed as

an additional coursework assignment and may not be given the time/attention required to deeply understand the material.

Prior research has investigated the experience of certified peer support specialists completing CITI Training. This gives the perspective of 5 individuals completing CITI Training that are also research naïve. Their results also determined comprehension difficulties.[5]

The purpose of the present correspondence is to convey experiences of CITI Training from the perspective of a highschool student/medical student. Ensuring CITI Training is available and effective training for all researchers is part of establishing researchers that are well versed in ethics training prior to engaging in human research. This is important to allow a larger and more diverse group of people to safely participate in the completion of human research projects. We aim to highlight the unintended and previously unassessed gaps in comprehension that can occur when research-naïve students complete CITI Training.

Methods

A pilot qualitative phenomenological research case design was used. The same student reflected on the experience of CITI Training during two chronologically separated times – as a highschool sophomore in North Carolina in 2017 and as a first-year medical student in Ohio in 2023. Journaling, a standardized research methodology to document experiences and reactions at the time of completing both CITI Training sessions was used.3 The student received research mentorship in both time instances from the co-author (MH). The key differences between the CITI training course completion |dates include the first author's chronological age, research exposure, and the completion of a Bachelor of Science (BS) degree in Chemical Engineering.

The journaling process included splitting the CITI Training into 3 days. At the end of each day, the student journaled their thoughts/feelings towards the sections they had completed that day. Then the student's reflections were analyzed by using a structured and iterative process of developing and refining key statements in the student's own words representing the students experience (thoughts/feelings) of taking the CITI Training, during face-to-face dialoguing with the research mentor as well as email

[1] BS. Second-year Medical Student. Wright State Boonshoft School of Medicine, Dayton, USA.

[2] BSE, MA, PhD. Carolinas Rehabilitation Department of Physical Medicine and Rehabilitation, Charlotte, USA and Department of Orthopedic Surgery and Rehabilitation, Wake Forest University School of Medicine, Winston-Salem, USA.

About the Author: *Lillian Nguyen is currently a second-year medical student of Boonshoft School of Medicine in Dayton, Ohio within a four-year program. She currently serves as an Academic Representative at her medical school and co-leads the Physical Medicine and Rehabilitation Interest Group.*

Correspondence:
Lillian F. Nguyen.
Address: 3640 Colonel Glenn Hwy, Dayton, OH 45435,USA.
Email: lillianfnguyen01@gmail.com

Editor: Francisco J. Bonilla-Escobar
Student Editors: Juan Pablo Medina Gaona
Copyeditor: Sohaib Haseeb
Proofreader: Laeeqa Manji
Layout Editor: Daniela Collazos

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correspondences. This process enabled open expression of opinions, dialogue, feedback and open expression of opinions and critiques of CITI Training topics, while maintaining optimal communication between the student and the research mentor.

Outcome

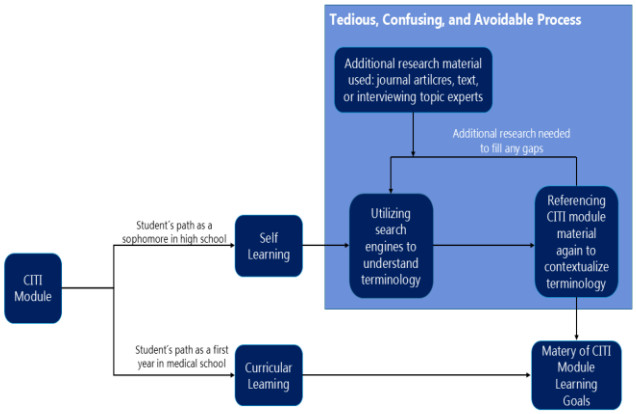
To our knowledge, this is the first project reporting the experience of completing CITI Training content from the perspective of a naïve highschool and medical student researcher. The student passed their CITI training courses in both instances, yet the experience and overall understanding was markedly different. They received a 91% on the HSR post-test and a 100% on the GCP post-test as a highschool sophomore. Yet, they felt they had not mastered the material nor felt confident in their understanding of human subject research ethics.

Several key themes emerged when the experiences of completing CITI Training as a highschool sophomore and a medical student were compared. As a naïve highschool student, the CITI Training modules were found to be filled with complex vocabulary and difficult concepts. The mean readability found within Human Subjects Research modules is 14.8 grade (Junior level in College).[2] The modules relied on terminology that at times was felt to be above the highschool student's intellectual ability to understand the material. This required extensive consultation with other resources to understand the intellectual content of the modules. Mainly, they used search engines such as Google to define and explain terminology. Translating the modules using other resources affected the fluency of learning and detracted from the material itself; thus, changing the ability of CITI Training to convey the material effectively. The entire process was felt to be tedious, confusing, and somewhat frustrating while the student attempted to understand the material. The student questioned the worth of CITI Training because they did not fully understand the modules. The student remarked that this detracted from the value of CITI Training and the module's ability to highlight ethical considerations in research. During the module's post-test assessments, they often found themself having to take the post-test multiple times in order to receive a passing score. Thus, reflecting on the fact that a passing score, or high passing percentage, does not equate to comprehension of historical bioethical perspectives of researching human subjects but, rather, repetitive rote memorization.

The student retook the CITI modules as part of their coursework during their first year of medical school. This occurred 7 years after they first completed the CITI program as a highschool sophomore in 2017. In between these years, they had experienced reading dense collegiate level texts, engaged in multiple research projects, presented posters at national and international conferences, and received a Bachelor of Science degree in chemical engineering with minors in psychology and biological sciences.

With their added experiences, they felt well-versed in research jargon and nomenclature. Therefore, during their second completion of the CITI Training modules, they were able to complete the modules faster and complete the course more efficiently. They remarked that the modules "made sense". Additionally, while the materials remained tedious, the modules were not confusing as compared to the user's experience completing CITI Training as a highschool sophomore. ***(Figure 1)*** outlines the steps the medical student took to achieve mastery of the CITI Training modules.

Figure 1. CITI Module Learning Pathways.



Legend: *CITI – Collaborative Institutional Training Initiative*
CITI Module – Good Clinical Practice and Basic Human Subjects Research CITI Training
Self Learning – the process a naïve researcher takes when approaching a CITI Module
Curricular Learning – the process an experienced researcher takes when approaching a CITI Module

Conclusion

Comparing these two differing research experiences, it is plausible that research-naïve individuals finishing CITI Training could be unprepared for their research position. CITI Training is a global training but it is not very inclusive of student learners. The gap between educational material and learned material can arise from the difference in actual users versus intended users of the CITI Training Modules. Completion of CITI Training allows the participant to fully comprehend the regulatory parameters required to perform ethical research. External resources such as a readability tester to objectively analyze the CITI Training text and rewrite the training to an 8th grade reading level could ensure all high school students would be able to successfully complete CITI Training. Future consideration could include surveying the perspective of CITI Training from researchers with experience. Future studies including a larger sample size should examine adjustments to the CITI program including tailoring content to highschool learners; lessening unnecessarily complex vocabulary; adding basic and concise concepts; integrating video webinar education to allow interactive learning; and the creation of vocabulary keys.

Summary – Accelerating Translation

This study compared two experiences from an individual when completing Collaborative Institutional Training Initiative Modules (CITI Training).

These modules are meant to teach and prepare researchers on basic ethical conduct when completing human research. The study participant completed their first CITI Training in highschool and their second CITI Training in medical school. The difference highlighted between the two experiences included the difficulty of understanding the material and the overall emotional experience of completing the training. The results suggested that CITI Training is experienced differently depending on an individual's prior research exposure and education level. The study suggests various edits to the CITI Training Modules including ensuring readability at an 8th grade level, including more basic topics, and integrating video webinar.

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Author Contributions

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Experience

Combating Rheumatic Heart Disease in Pakistan: An Experience of Training, Screening and Community Outreach

Amna Zaheer. [1] [2]

The Experience

Understanding Rheumatic Heart Disease

Rheumatic heart disease (RHD) is a systemic immune disorder that follows an episode of rheumatic fever, typically caused by an infection of the throat with beta-hemolytic streptococcus bacteria. RHD poses significant challenges in developing nations such as Pakistan, where it remains endemic and accounts for a substantial proportion of cardiovascular deaths among young people, contributing to approximately 250,000 deaths annually worldwide.[1] The prevalence of RHD is particularly high among children and young adults in low-income countries due to factors like poverty, inadequate healthcare resources, and poor nutrition. The prevalence of Rheumatic Heart Disease is high among children and young adults in low-income countries due to poverty, inadequate health resources, and lack of nutrition. RHD remains a significant contributor to cardiovascular mortality and disability in low- and middle-income regions, particularly affecting children in South Asia, the Pacific islands and Sub-Saharan Africa. Between 1990 and 2019, the age-standardized incidence and prevalence rates of RHD rose by 14.4% (from 11.2% to 17.0%) and 13.8% (from 11.0% to 16.0%), respectively. The incidence and prevalence rates exhibited an upward trend in areas with low and low-middle Socio-Demographic Index (SDI), while regions with high-middle and high SDI showed a declining trend.[2]

Darul Qalb: Mission and Initiatives

Darul Qalb, a U.S.-based organization founded in 2014, is dedicated to eradicating RHD in low- and middle-income countries like Pakistan and Tanzania. The organization focuses on training medical students to detect subclinical RHD using portable ultrasound devices, such as the GE Vscan and Butterfly iQ. Since its inception, Darul Qalb has trained over 250 medical students. I began volunteering with Darul Qalb in 2022 and took a lead role in organizing a training session on detecting RHD in May 2023.

Training Session at Karachi Medical and Dental College

On May 12, 2023, Darul Qalb, in collaboration with HOPES, a student-run welfare organization at Karachi Medical and Dental College, conducted a free of cost training session for third, fourth and final year medical students. This session was led by Dr. Ahmad Akhtar, who provided hands-on training in performing ultrasound examinations of the heart using advanced devices such as the GE Vscan and Butterfly iQ. During this session, Dr. Akhtar introduced us to the Point-of-Care Ultrasound (POCUS) technique, an essential method for assessing heart valve changes that may indicate subclinical RHD. The training session had a duration of 2 hours and was intensive, allowing students to engage in hands-on practice on human subjects as well as on heart models. The combination of hands-on practice and model-based learning was designed to ensure that students were adequately prepared to proceed with screening real patients for subclinical rheumatic heart disease (RHD) using advanced ultrasound technology. This comprehensive training aimed to bridge the gap between theoretical knowledge and practical application, giving me and other students the confidence and competence to move forward in a clinical setting.

Community Outreach and Screening Initiative

Following the training, our team initiated a community outreach program to screen children for subclinical RHD. We set up ultrasound stations and conducted examinations on children, applying the skills acquired during our training. Experienced mentor, Dr. Ahmad Akhtar who is a trained doctor from the United States was on hand to guide and supervise us as we performed cardiac scans to detect potential abnormalities in the children's hearts for which Darul Qalb obtained an IRB approval from National Bioethics Committee. According to a study, the specificity of screening of patients with RHD are 90.2%. This stringent approach did not compromise sensitivity, which remained robust at 85.3% (95% CI: 78.0% - 90.9%). This suggests that the screening method is effective in accurately identifying true positive cases of RHD while minimising false positives.[3]

Impact and Reflection

This screening process was both educational and fulfilling. I was

[1] Fourth-year Medical Student. Liaquat National Medical Hospital and Medical Collegename, Karachi, Pakistan.

[2] Darul Qalb, Knoxville, Tennessee, United States

About the Author: *Amna Zaheer is currently a 4th year medical student of Liaquat National Hospital and Medical College, Karachi, Pakistan of a 5 year program. She is a volunteer at Darul Qalb. She has worked in more than 26 organizations both international and national where she has contributed to their research department, media department, volunteering department and human resource department.*

Correspondence:

Amna Zaheer.

Address: National Stadium Road, Karachi 74800,Pakistan.

Email: amnazaheersiddiqui7@gmail.com]

Editor: Francisco J. Bonilla-Escobar
Student Editors:Varsha Coimbatore Sathyabal. Khansa Khan, King Mwila
Copyeditor: Emmanuel Phiri
Proofreader: Laeeqa Manji
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This screening process was both educational and fulfilling. I was able to identify cases of subclinical RHD and refer them for further evaluation and treatment. The experience highlighted the critical role that early detection plays in improving children's lives and underscored the importance of community outreach in enhancing health outcomes.

Figure 1. Training Session on Rheumatic Heart Disease Detection at Karachi Medical and Dental College.

Legend: This figure depicts a training session conducted by Darul Qalb in collaboration with HOPES at Karachi Medical and Dental College on May 12, 2023. The session, led by Dr. Akhtar, provided hands-on training to medical students on the use of advanced portable ultrasound devices, such as the GE Vscan and Butterfly iQ, for the detection of subclinical Rheumatic Heart Disease (RHD). Students learned the Point-of-Care Ultrasound (POCUS) technique, which is crucial for assessing heart valve changes indicative of RHD. The image captures students actively engaging with the ultrasound technology under the guidance of experienced instructors, emphasizing the integration of medical education with practical skills in a low-resource setting.

Through this training and screening exercise, I gained invaluable skills in using advanced medical technology while contributing to a meaningful cause. Participating in this initiative not only improved my practical skills but also deepened my sense of responsibility and commitment to community health.

Community outreach programs, such as the screening for rheumatic heart disease (RHD) in low-income countries, are crucial for several reasons. Firstly, they enable early detection of RHD, a condition that often remains undiagnosed in these regions due to limited access to healthcare services. By identifying RHD at an early stage, these programs help in preventing the progression of the disease, which can lead to severe heart damage and even death. Secondly, outreach programs bring essential healthcare services directly to underserved populations, overcoming barriers such as distance, cost, and lack of awareness. This approach not only improves health outcomes but also raises awareness about RHD, contributing to better prevention and management of the disease. Lastly, by involving local communities and healthcare providers, these programs help build local capacity, ensuring that the impact of the intervention is sustainable over the long term. In essence, community outreach programs are vital in addressing healthcare disparities and improving cardiovascular health in low-income countries.[4]

Figure 2. Community Screening Initiative for Subclinical Rheumatic Heart Disease.

Legend: This figure illustrates the community outreach initiative that followed the training session, where medical students applied their newly acquired ultrasound skills to screen children for subclinical Rheumatic Heart Disease (RHD). The screening took place in a local community setting, where ultrasound stations were set up to facilitate the examination of children's hearts. The image shows students performing cardiac scans while being supervised by mentors, highlighting the practical application of their training.

Summary – Accelerating Translation

Rheumatic Heart Disease (RHD) is a chronic condition resulting from untreated streptococcal throat infections that lead to rheumatic fever, primarily affecting heart valves. RHD remains prevalent in low-income countries like Pakistan, where it significantly contributes to cardiovascular deaths in children and young adults. This study focused on training medical students to use portable ultrasound devices to detect subclinical RHD in children, enabling early diagnosis and treatment.

In collaboration with Darul Qalb and HOPES, a training session was held at Karachi Medical and Dental College. Medical students received hands-on training in utilizing portable ultrasound devices such as the GE Vscan and Butterfly iQ to identify heart valve abnormalities related to subclinical RHD. The training covered the Point-of-Care Ultrasound (POCUS) technique for assessing heart conditions.

The early detection of RHD through portable ultrasound devices in community outreach programs can help prevent the progression of the disease. Moreover, training medical students not only enhances their diagnostic skills but also contributes to improving cardiovascular health outcomes in low-income regions.

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Experience

The Measure of Success – A Day in the Life of a Pediatric Surgeon

Chetan Padashetty,[1] Shalini G. Hegde.[1]

The Experience

I often ponder about how to measure a surgeon's success. Is it the volume of surgeries done – being fast and furious, ticking off cases from a list; is it the complexity of surgery – beads of sweat on the forehead and blood on the floor or is it having a long line of patients waiting for you?

Ahmed (name changed) is a well-built, beautiful boy in intensive care with a persistent left sided lung collapse. He presented to the emergency room with a short history of breathlessness for 3 days which had progressively worsened such that he could no longer walk or perform his daily activities. On general examination, he was noted to be restless, irritable and tachypneic with a respiratory rate of 35/min. His pulse rate was 124/min and BP 150/100 mmHg and he had multiple small sub centimetric cervical lymph nodes. On systemic examination, he had reduced air entry on the left side with no other positive findings. His X-ray showed a complete collapse of the left lung with significant tracheo-mediastinal shift ***(Figure 1A).*** He was intubated, stabilized and moved to intensive care after which a contrast enhanced computed tomography (CT) of the chest was performed. Besides the findings seen on the X-ray, CT scan of the thorax showed right lung hyperinflation, a moderate right sided pneumothorax, conglomerate lymph node masses in the mediastinum and a cut off in the left main bronchus likely secondary to a mucus plug.

We are all now gathered in the intensive care unit. The flexible bronchoscopy confirms our worst fears – this is no mucus plug - it is a menacing, ugly polypoid growth obstructing the left main bronchus and threatening to grow into the right. As part of his treating team, my attending, Dr. Shalini Hegde (SH), and I from Pediatric Surgery, agree with the others against taking a biopsy. Ahmed was on maximal ventilatory parameters and yet his saturation hovered only around 80 - the risk of torrential bleeding due to the biopsy, could tip the delicate balance of life and death. As per standard care, an endobronchial procedure[1] would have been ideal for diagnosis, treatment or palliation, but as is often in critical situations, the decisions need to be based on the treating team's discretion.

Despite his one good lung, the affected lung is acting like a shunt, devouring precious blood supply but not returning sufficient oxygen. In midst of the discussion about the biopsy, Oncology opines that the tumor is unlikely to be chemo sensitive. All eyes turn towards SH as the boy desperately needs an airway. Open the bronchus and remove the tumor, remove the lung – Do something. I can read SH's mind as she contemplates the suggestions. Her decade long experience of surgery in children guides her to decline doing a major procedure. Although, it's exciting for a surgeon to have a challenge, she can tell that Ahmed is in too fragile a state to do anything heroic. Having completed my training in general surgery and now in my second year of pediatric surgery training, I find myself in agreement with her decision. Although I am ready to roll up my sleeves and get into the fray, as time goes by, I realize it is more important to learn when not to operate. These small but important learnings do not come under the surgical curriculum[2] but are best learnt through a mentor.[3]

We proceed to have a frank discussion with the parents about Ahmed. We gently tell them that their child is likely to have a malignancy and that it doesn't look good. For the parents, it is far easier to accept the diagnosis than to watch Ahmed struggle in intensive care and when we tell them of our inability to surgically help their child, they accept our failure with a grace far greater than our own. They agree to a lymph node biopsy for further diagnosis.

SH looks at me, thumps me on the back and says to do the biopsy. Everything now depends on it. I struggle during the procedure - only small shreds come out. I call SH for help, but our combined attempt is met with torrential bleeding and we hastily pack the wound. As I apply a compression dressing, I can't help feeling utter failure. In the ensuing days, I hear that Ahmed's condition has worsened and his parents have opted for chemotherapy.

A week later, I receive a picture of Ahmed's current x- ray ***(Figure 1B).*** Astonishingly, the left lung has opened completely, signaling that Ahmed will soon breathe on his own. I reflect on the miraculous turn of events and send the picture to SH with the caption – a successful lymph node biopsy. I knew we hadn't

[1] Department of Pediatric Surgery, St. John's Medical College Hospital, Bengaluru, India.

Correspondence:

Chetan Padashetty.

Address: Marathahalli Rd, next to Bank of Baroda, John Nagar, Koramangala, Sarjapur, Bengaluru - 560034, Karnataka, India.

Email: chetanpadashetty1610@gmail.com

Editor: Francisco J. Bonilla-Escobar
Student Editors: Prajjwol Luitel, Siddhant Govekar, Rachit Shah
Proofreader: Amy Phelan
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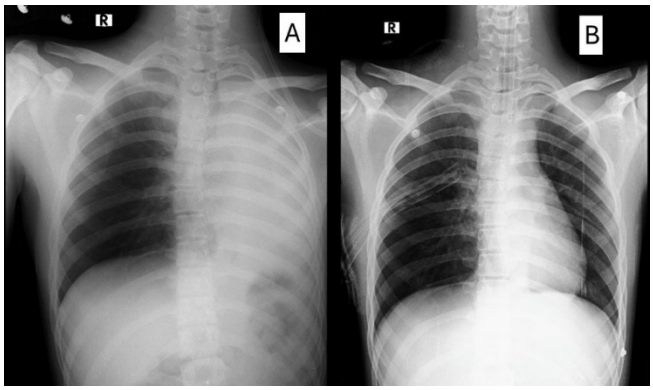
skillfully dissected out a perfectly oval shaped node, we'd abandoned mid procedure, and now we were faced with a diagnosis of high-grade cancer. Nevertheless, without a textbook biopsy, the x-ray meant that Ahmed would soon reunite with his family and his parents will cherish his homecoming.

Indeed, it's a lifetime of learning, but I now realize that the measure of success in surgery is doing the right thing at the right time

Figure 1. X-Ray A and B



Legend: A. Initial chest X-ray abdomen showing complete left lung collapse with mediastinal shift; B. Follow up chest X-ray showing bilateral expansion of lung fields post chemotherapy.

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Experience

The Pupil's P's: An Alliterative Tool and Practical Framework for Managing Older Patients

Milton Louca,[1] Peter Gonski.[2]

Introduction

Geriatrics is founded on the wisdom of its practitioners, patients and pupils. In patients over 65, 23% of global disease burden is attributable to them,[1] and 50% have 1 or more 'geriatric conditions' – referring to the collective signs and symptoms common in elderly patients.[2 3] To address complex geriatric conditions, compounded by time, geriatrics mandates a multi-factorial, hypothesis-driven approach. Thus, optimizing aged care must coordinate numerous, major issues. In 1965, 'Isaac's I's'[3,4] – instability, immobility, incontinence, and impaired intellect or memory – were coined to encapsulate elderly-patient ailments. In 2017, Mary's M's',[5] – mind, mobility, medications, multi-morbidity, and matters most – sought to encompass more features of aged care. Due to the complexity of geriatric patients, medical students are deterred from the aged care specialty.[6] Globally, there are gaps in geriatric education of medical students which require meaningful and broad curricula proportionate to ageing population demographics.[7] With these shifting demographics, prioritizing medical education for aged care will improve healthcare for all.[8] Mnemonics offer a powerful method to reshape brain networks, improve memory performance, increase motivation to study, and are reportedly more enjoyable than rote rehearsal.[9,10] Accordingly, through our experience, we attempt to reconcile aged care principles to provide our own alliterative device for medical students. This tool enhances existing mnemonics in aged care by incorporating these ideas into a larger framework which educates students to optimize the care of older people. Here, we cannot be exhaustive of each issue. Rather, we aim to introduce each issue for students to contemplate on their rounds. Together with the insight and contribution by an accomplished geriatrician, this instrument was distilled by the experiences and reflections of a resident from medical school into employment. For posterity and students of aged care, who will inevitably be at the coalface taking care of an ageing population, we deliver these portable, alliterative learnings: *The Pupil's P's.*

1. Peculiar Presentations

For these prevalent 'geriatric conditions', we stand upon the shoulders of 'Isaac's Geriatric Giants': instability (6-22%), incontinence (9-27%), immobility, iatrogenesis and impaired intellect or memory (3-31%).[3] More have been proposed: frailty, sarcopenia, and anorexia of ageing (1.3-12%).[2,4] From medical school, we suggest students consider such hallmark precipitants for presentations. Otherwise, an unclear, confused historian or unremarkable examination make it difficult to generate reasoning and management. Collateral history and family involvement are indispensable. A common presentation in older people is a fall with neck of femur fracture. Here, there is a necessary cause of their fall and fracture. For example, delirium causing confusion (impaired intellect), secondary to urinary tract infection or overflow constipation (incontinence) compounded by gait imbalance (instability), and complicated by osteoporosis (immobility).

2. Psychiatric and Psychological Perturbations

Given the brain's importance in aged care, cognition testing must not be overlooked. On rounds, delirium, depression, and dementia can be screened for swiftly. The Diagnostic and Statistical Manual of Mental Disorders (DSM-V) provides the elements for each neurocognitive disorder.[11] By utilising the 4 'A's Test (4AT) – that is, a widely-used, efficient screening tool incorporating Abbreviated Mental Test-4 for orientation, Alertness, Attention and Acute fluctuations – students can consider delirium and these conditions alongside possible causes.[12] Alternatively, the Mini Mental State Examination (MMSE)[13,14] and Confusion Assessment Method (CAM)[15] are validated, widely-used screening tools. Often, causes of delirium include: pain, infection, nutrition, constipation, hydration, endocrine and electrolytes disturbances, stroke, medications and alcohol. Hypoactive delirium – characterised by reduced motor activity, lethargy, withdrawal – is under-recognized and its causes should be evaluated and managed accordingly.[16] Fundamentally, the key features of delirium differentiating it from dementia are: decreased attentiveness/awareness, and a fluctuating course in cognition. For example, patients may be mentating appropriately in the morning and behaviorally difficult in the evening. Behavioral and sleep charts are extremely helpful. When

[1] BSc/LLB(Hons), MD. St George Hospital/The Sutherland Hospital/UNSW, Sydney, Australia.

[2] MBBS. St George Hospital/The Sutherland Hospital/UNSW, Sydney, Australia.

About the Author: *Dr Milton Louca is a Clinical Doctor (The University of Sydney, Sydney, Australia) and Conjoint Associate Lecturer (University of New South Wales, Sydney, Australia).*

Correspondence:

Milton Louca.

Address: High Street, Kensington, NSW 2052, Australia.

Email: milton.louca@gmail.com

Editor: Francisco J. Bonilla-Escobar
Student Editors: Shreya Sirivolu, F M Nageyle.
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assessing mentation, it is also an appropriate time to establish capacity for medical decision-making and advanced care directives.

3. Peristaltic Products

In geriatrics, the 'p-words' denoting products of bowels and bladders are crucial. When seeing older patients, students should anticipate incontinence, constipation and urinary tract infections (UTI) (12.7%),[2] given this population is disproportionately afflicted by these issues. Brief, non-pharmacological strategies a student could suggest on rounds to manage urinary incontinence are: implementing a scheduled toileting program, diarizing fluid balance, physical therapy for pelvic floor exercises, and for constipation: stool diary, bowel training (optimizing the gastrocolic reflex), adequate fibre intake and hydration and regular exercise.[17] Students should be informed of common practices which provide little value to hospitalized patients, like the prescribing of docusate which has significant associated costs – estimated to exceed $US 100 million – and multiple trials failing to show any benefit or proven clinical effectiveness.[18] For prolonged admissions and prior to discharge, cystitis symptoms – suprapubic discomfort/pain, dysuria, haematuria, malodorous/cloudy urine, increased frequency, hesitancy or intermittency – should be screened for and a urine mid-stream culture requested to treat empirically and appropriately. Such proactivity could prevent re-admission for sepsis, delirium and/or fall precipitated by a UTI.

4. Profound Pain

In aged care, students should attempt to identify and classify pain – for example, acute, sub-acute or chronic and somatic, visceral and neuropathic. Students should recognize that pain is a biopsychosocial phenomenon.[19] Therefore, its experience should be validated and addressed with active and passive approaches. This permits appropriate decision-making. Non-pharmacological interventions – heat and cold packs, quiet spaces, mobilization and exercise – are always first-line. Given its regular prescribing in a hospital setting, simple analgesia should be used at a reduced frequency and duration. For example, paracetamol 1g three-times-daily provides a buffer in older people who are malnourished, underweight (generally <50kg) and likely to have decreased hepatic mass.[20] For a 50-kilogram patient, the 1g three-times daily of paracetamol equates to approximately 15 mg/kg every four-to-six hours, or 60mg/kg/day (not exceeding 3g daily). Also, students should be cognizant of non-steroidal anti-inflammatory contraindications found in older patients such as asthma, gastrointestinal ulcers, blood dyscrasias, and renal disease/injury.[1]

5. Polypharmacy

Polypharmacy is using five or more medications, including prescription, over-the-counter and complementary medicines.[21] Iatrogenic presentations and symptoms are common (45-52%).[2,21]Age affects pharmacodynamics – that is, what the body does to a drug. This occurs through loss of reserves, reduction in lean body mass, reduction in mobility and interaction with the cytochrome p450 system. Commonly, antidepressants, anticholinergics, antibiotics and diuretics have unintended consequences in older people. Medical students should consider the updated Beers[22] and STOPP/START[23] criteria which highlight potentially inappropriate medications in older patients for the purposes of prescribing and deprescribing. In both the hospital and community setting, involving pharmacists is vital.

6. Pressure Injuries

Pressure injuries are localized skin damage resulting from pressure, shear or friction. Typically occurring over bony prominences, these are associated with acute illness, medical devices including prostheses and dressings.[2] Pressure injuries are frequent, painful, costly and, mostly, preventable. For immobile or post-operative elderly patients, students must consider pressure injury development. The National Pressure Injury Advisory Panel (NPIAP) Staging System classifies pressure injuries into five stages – (1) intact skin with non-blanchable erythema, (2) partial-thickness skin loss involving epidermis/dermis, (3) full-thickness skin loss, but not crossing fascia, (4) full-thickness skin loss crossing fascia and (5) unstageable because eschar/slough obscures extent of tissue damage.[24] For prevention, assess for erythema, blanching, temperature, edema, induration and skin-breakdown. Medical students can liaise with nursing staff to utilise regular re-positioning and pressure-relieving devices to avoid pressure injuries.

7. Physiological Deconditioning

In geriatric medicine, acute hospital care has its own perils. Prolonged inpatient care can accelerate patient deterioration; begetting reduced mobility, cachexia and malnutrition. Students should be aware that even ten days of immobilization and bed rest in healthy older adults results in a one kilogram loss of lean muscle mass.[25,26] Rockwood's definition of 'frailty' encapsulates the interaction of medical and social factors resulting in a decreased capacity to deal with stressors.[27] Students should be aware of the 'Hallmarks of Aging' to foster an appreciation of chronic disease progression, multimorbidity, and translate this into a clinical frailty index or scales. [27,28] As part of management, students should seek to modify the hospital environment by de-emphasizing bed rest with patients, remove high rails and bed heights, and suggest early and active mobilization with physiotherapy and socialization.[29]

8. Poor Perception

Students must consider age-related perceptual deficits concerning vision (presbyopia, glaucoma, cataracts, macular degeneration), hearing (presbycusis), balance and dentition (dentures, false teeth). Older patients are affected disproportionately (4.6-22.8%) and may have available impairment aids. On rounds, students could screen for deficits in visual acuity utilising a digital Snellen chart, or an Amsler Grid which can detect metamorphopsia in age-related macular degeneration. If there is sufficient clinical suspicion for hearing

loss, a referral for audiometry should be made. If not considered, these impairments create poorer prognosis, delirium, and poor quality-of-life and communication.

Table 1. The Pupil's P's – Summary and Management Strategies/Learnings for Medical Students.

'P'	Management Strategy/Learning
Peculiar Presentations	• Note *Issac's I's* and *Mary's M's – The Geriatric Giants* • Gain collateral history • Involve patient's family early
Psychological Perturbations	• Screen cognition and depression – 4AT, MMSE or CAM • Evaluate causes and manage accordingly • Establish decision-making capacity
Peristaltic Products	• Anticipate incontinence, constipation, UTI • Employ non-pharmacological strategies first-line • Be proactive in identifying and treating UTIs
Profound Pain	• Recognise and classify as biopsychosocial phenomenon • Employ non-pharmacological strategies first-line • Dose-adjust simple analgesia on weight or renal function
Polypharmacy	• Assess prescriptions where >5 medications • Consider Beers and/or STOPP/START criteria • Involve inpatient/community pharmacy
Pressure Injuries	• Consider in all unwell, geriatric patients • Stage pressure based on NPIAP system • Suggest regular re-positioning/pressure sore devices
Physiological Deconditioning	• Acknowledge hospital-induced deconditioning • Note patient's Frailty Score • De-emphasize bed-rest & begin early mobilization
Poor Perception	• Inquire for vision, hearing, balance and dentition • Ensure patient aids are available • Screen with Snellen chart, Amsler grid, audiometry
Partner Practitioners	• Early activation of multidisciplinary care • Discuss and observe allied health assessments • Shadow peri-operative Orthogeriatrics admission
Post-Hospital Plan	• Discharge planning begins once medically stable • Learn about discharge destinations early in rotation • Attend family meetings
Palliative Care	• Palliative care prioritises dignity and comfort • Aimed at quality of life and symptomatic relief • Survival period is secondary objective
Parsimony	• Do no more than necessary to patients • Goals of care phases direct management • Treat the patient; not the problem(s)

9. Partner Practitioners

Students must foster collegiality in multidisciplinary care. This benefits diagnosis and management of patients. Medical practitioners – including general practitioners and specialists – are only one facet of multidisciplinary teams. The role of geriatric medicine remains diagnosis and management to guide and galvanize these professions. For example, physiotherapists have intimate knowledge of surface anatomy and locomotion. Speech pathologists assess swallowing to prevent aspiration, occupational therapists ensure a safe, functional home environment, social workers champion crisis relief or orchestrate legal hearings to appoint surrogate decision-makers, and nurses – specialist and generally-trained – afford comprehensive, patient-centered care. Students could attend, discuss and observe the assessments and documentation conducted by these various allied health specialties to grasp their purview. For example, the peri-operative management of an orthogeriatric patient would necessitate the activation and co-ordination of a multi-disciplinary team. It would provide a fantastic experience for medical students to appreciate the value in an integrated model of healthcare.

10. Post-Hospital Plan

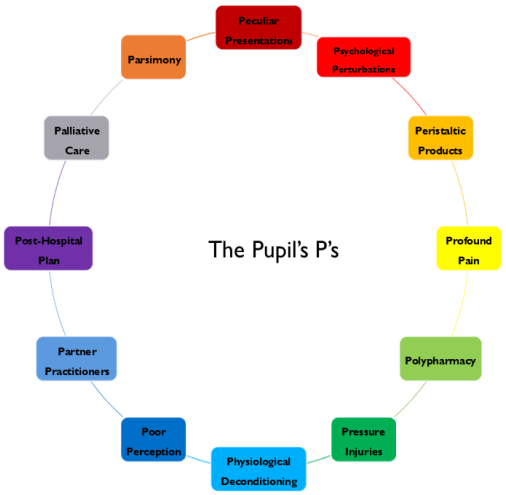
Discharge planning is an interdisciplinary approach to ensure continuity of care. Early and inclusive discharge planning cannot be understated. Thus, medical students should learn about discharge destinations and home care services as soon as practicable on their aged care rotation. A sound comprehension would be highly useful for clinical practice. Often, discharge planning is the rate-limiting-step to transition an older patient from hospital to home. Use of an intermediary rehabilitation facility can bridge those requiring specialist support. Students must understand a person's social factors, finances and decline, and explore carer stress to formulate and effective, long-term management plan. By attending family meetings, students can appreciate the logistical and ethical issues – non-maleficence, beneficence, autonomy and justice – in accomplishing safe, effective patient discharge.

11. Palliative Care

Palliative care represents a specific, all-inclusive process by which to honor a patient's right to dignity and comfort. In some instances, supportive care might be a more appropriate term than palliative care where life expectancy progresses to months. Foremost, students should be aware that advanced care directives must be established. Using collateral history from family and hospital notes, and considering the relevant local law, students should assess the appropriate decision maker in each case. These include the patient, next of kin, friend, non-paid carer and/or neighbor. If appropriate, establishing end-of-life care by involving family and palliative care colleagues is vital. Depending on the circumstances of each case, students should observe these discussions to identify, from the patient's desires, restorative versus supportive goals. For example, in palliative care, the survival period is not the singular determinant of treatment; life prolongation is a secondary objective to quality of life and symptomatic relief. Important questions revolve around the patient's wishes. Ensuring there has been some discourse on the topic of cardiopulmonary resuscitation, intubation and intensive

care helps to determine the desired clinical outcomes. Fundamentally, to deliver holistic care, geriatrics mandates interdisciplinary medical, psychosocial, cultural and spiritual considerations.

Figure 1. The Pupil's P's – a Conceptual Framework and Educational Tool for Comprehensive Geriatric Assessment.



12. Parsimony

Parsimony – that is, doing no more than is necessary – is paramount in caring for elderly patients (Figure 1). Too often, practitioners sustain momentum bias in diagnosis and management. This produces unnecessary medical intervention(s). Oddly, William of Ockham's Razor – 'plurality must not be posited without necessity' – is the Principle of Parsimony. In geriatrics, students should appreciate Ockham's Razor is antithetical to diagnosis because, as we have emphasized, co-maladies warrant the generation of multiple differential diagnoses.[30] A 'goals of care' clinical framework which entails a three-phase model can classify a patient's care as either curative, palliative, or terminal according to an assessment of likely treatment outcomes for the specific patient. This method allows students to practice avoiding overdiagnosis and overtreatment whilst guaranteeing comprehensive patient-centered care.[31] In this complex management of older patients, we must always treat the patient before us; not the problem(s) we uncover.

Conclusion

As in life, gerontology is a rite of passage in medical school and healthcare. By experiencing aged care, we have come to appreciate its medical and social sophistication. Despite many attempts, honing this fount of knowledge is near impossible. For the aged care pupils, we have provided an alliterative introduction and tool to manage elderly patients on the ward or in the community. It is our hope that this piece orientates the aged care student and serves as a reference on ward rounds to learn about and manage older people. Using this platform, we encourage students to integrate these principles into clinical practice. Regardless of their chosen specialty, we urge students to reflect on their experiences in geriatrics for their medical careers. To students, we offer *The Pupil's P's* for the comprehensive care of older people – forever treating the patient; not the problem.

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