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IJMS International Journal of Medical Students

Editorial

Back to the Future: Medicine Beyond the COVID-19 Pandemic

Madeleine J. Cox,[1] Leah Komer,[2] Ciara Egan,[3] Purva C. Shah,[4] Nikoleta Tellios,[5] Annora A. Kumar.[6]

It has been over a year, and the unforeseen consequences of the SARS-CoV-2 outbreak (COVID-19) continue to impact all domains of our lives. This global phenomenon has meant that medical professionals, students, and scientists have had to adapt to changes in policy, practice, and education to withstand challenging environments and uncertainty. In the face of the incomprehensible pain and suffering caused by COVID-19, we are humbled by the sacrifices made by all healthcare workers around the world, and together we must manifest their resilience and unity in order to guide the era of medicine beyond the COVID-19 pandemic. Research efforts towards COVID-19 have been tremendous, yielding important insights into the biopsychosocial impacts of the virus. The contributions of the *International Journal of Medical Students (IJMS)* towards the growing scientific field of COVID-19 research have been twofold. *IJMS* has provided a platform for medical students to share their research, experiences, and training during these unprecedented times. *IJMS* has also helped to foster an interest in research at the student level by training new generations of editors and reviewers, and thus shaping the next generation of physician-scientists.[1] While it is important to reflect on current events to better understand the situation at hand and prepare for the future, we need to remember that there is medicine beyond the pandemic. Although articles unrelated to COVID-19 seem to have moved out of the spotlight, they are more important than ever. We hope this issue of the *IJMS* can be a "passing of the baton" from COVID-19 centered experiences to a new era of excellence in research by medical students.

We are grateful and humbled to be a space of reflection for many students during this pandemic, and we have all learnt from the shared experiences of our peers. Many have addressed the challenges of online learning,[2,3] and practicing clinical procedures remotely.[4] Others have utilized online platforms to provide teaching to the youth,[5] becoming more connected with friends, family, and current events.[6] With clinical placements cancelled or taught remotely, students have volunteered in their communities through telemedicine services,[7] assisting community hospitals,[8] and providing mental health services.[9] Some students have been challenged by unfair working conditions,[10] inadequate patient exposure, and clinical skill development.[11] We have seen diverse COVID-19 experiences from around the globe, from Brazil to the Philippines, to Nigeria, and more. Seeing the resourcefulness of medical students during a pandemic is a reminder that although medical training can take a toll on our mental health, we are resilient and we are the protagonists of our learning and training.

In his editorial one year ago, Editor-in-Chief Dr. Francisco J. Bonilla-Escobar reminded all of us during the first wave of the pandemic that "Nevertheless, we need to be sure that we are moving forward".[12] We continue to do this, and in this issue we have published original articles, short communications, a review, and case study unrelated to the pandemic. We learn of the importance of medical students identifying serious clinical conditions earlier than their senior counterparts,[13] peer-to-peer tutoring that reduces the dependence of expert training and instills leadership and communication skills in students.[14] Furthermore, Rondilla et al. describes patient rationale for folk medicine, which enables medical professionals to strengthen relationships with patients and thus, provide effective healthcare.[15]

In this issue we are introduced to automated hematological analyzers for the potential screening and diagnosis of malaria[16] and neuronal interconnections observed in adversely affected children for predictive diagnoses and prevention of paediatric mental health conditions.[17] Huang et al. provide a possible public health solution of establishing eyeglass donations to serve vision impaired low socioeconomic populations.[18] Additionally, Nahian et al. demonstrate the importance of surgical adaptations in the setting of an eight year old with a cerebral palsy neuromuscular hip disorder.[19] We are also made aware that we are living in the technological era of social media dominance. The benefits of telehealth[20] and easily accessible, comprehendible medical resources[21] are discussed, however, we are also reminded about the risks of breaking patient confidentiality,[20] and providing misguided and potentially dangerous information through social media networks.[22]

The foundation of a strong patient-doctor relationship is based on the respect of a patient's background. Good communication skills are an important part of this, as seen in the experience of Jayawardana with a deaf patient.[23] The experience by Rector et al. reinforces this by highlighting the importance of intercultural communication and describing their insights into Hispanic gender roles and culture.[24] We are also positioned to appreciate the benefits of working and learning overseas and in remote locations,[25,26] which can test the resilience of medical students especially if language or cultural barriers are involved. It is also great to see communication within the IJMS community. In this issue, we see the response of Yamamoto-Moreno[27] to Patricio Garcia-Espinosa,[28] a leader in neurology, reiterating the importance of hypertension awareness in controlling the risk of stroke in Mexico

Finally, in the experience article *The Vigil of Medicine* written by Kelly, she utilizes her hiking trip as an analogy of the journey of medicine;[29] fraught with challenges of physical demands and mental exhaustion, which is also well described by Young.[30] She brings all medical professionals together, be it a pandemic or not, to remind us we are never alone. The *IJMS* agree with this underlying message of unity, and proves this by bringing together medical students from around the world to write this issue. It is a reminder that as medical students, junior doctors or senior consultants, we are never alone.

Although COVID-19 has taken away our opportunities for clinical clerkships and in-person learning,[31] it has given us an insight into the responsibilities that we will face in as future doctors. In the same way that exposure to stress in previous generations can trigger genetic changes that are passed down to children and grandchildren,[32] the pandemic is a stark reminder that we will one day inherit the responsibilities of caring for the health of society. However, our genetic makeup also provides us the ability to heal from trauma and stress in multiple ways. The human body's healing process replaces the damaged tissue with the same type as before, or, when it is unable to, forms a scar. Similarly, for some of us, there is no returning to the

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training we had pre-pandemic, as we will be graduating and starting in the front-line work force. For others, the future of clinical training is less certain as teaching has shifted to online learning and some programs have been prolonged. As we progress, and recover, let this scar remind us of our resiliency, unity, and let us return to our passion for research, discovery, and learning.

References

1. Bonilla-Escobar FJ, Kumar AA, Farrugia-Bonnici G, Ryan PM, Găman MA. A Grain of Sand in the Ocean: Training New Generations of Editors, Reviewers, and Medical Scientists. Int J Med Students. 2020 Sep-Dec;8(3):213-6.
2. Botello-Hernández E, García-Espinosa P, Ruiz-Padilla JP, Torres-Hernández G, Fernández-Garza LE. Medical students' perception towards the COVID-19 pandemic in Mexico: distance learning, assisting to hospitals, and vaccination. Int J Med Students. 2021 Jan-Apr;9(1):33-6.
3. Wafula I, Ong'era EM. Deprived of the Sea: Being a Kenyan Final-year Medical Student During the COVID-19 Outbreak. Int J Med Students. 2021 JanApr;9(1):80-1.
4. Cedeño TDD, Rocha IC, Ramos KG, Uy NM. Learning Strategies and Innovations among Medical Students in the Philippines during the COVID-19 Pandemic. Int J Med Students. 2021 Jan-Apr;9(1):77-9.
5. Grunhut J, Brown S, Averkiou P. Service Learning Goes Virtual in the Viral World. Int J Med Students. 2021 Jan-Apr;9(1):75-6.
6. Yoo JH, Mercer NP. COVID-19: Not a Positive Test Result, but a Positive Outlook. Int J Med Students. 2021 Jan-Apr;9(1):88-9.
7. Correa TL, Guelli MSTC. Telemedicine Volunteering Experience as a Medical Student During the COVID-19 Pandemic in Brazil. Int J Med Students. 2021 JanApr;9(1):71-2.
8. Aderounmu, B., Odedara, A. Clinical Volunteering through the Pandemic: An Experience from Final Year Medical Students in Nigeria. Int J Med Students. 2021 Jan-Apr; 9(1):66-7.
9. Soyemi T. Coping Strategies for Medical Students During the Pandemic: A Nigerian Perspective. Int J Med Students. 2021 Jan-Apr;9(1):90-1.
10. Torres-Hernández, G, García-Espinosa, P, Botello-Hernández, E, Ortega-Moreno, D. Mexican Medical Students Protest During COVID-19 Pandemic. Int J Med Students. 2021 Jan-Apr; 9(1):63-5.
11. George, AP, Ewens, EE. Two Student Perspectives on Clinical Medical Education During the COVID-19 Pandemic. Int J Med Students. 2021 Jan-Apr;9(1):61-2.
12. Bonilla-Escobar FJ. Leadership and Health: The Scientific Journal's Mission of Spreading Science in Times of Pandemic. Int J Med Students. 2020 Jan-Apr;8(1):9-10.
13. Sadeh R, Gat T, Kaplan O, Porges T, Zeller, L, Barski L, et al. Case series: Point-of-Care Ultrasound Conducted by Medical Students During their First Clinical Rotation Changes Patients' Primary Diagnosis and Management. Int J Med Students. 2021 Jan-Apr;9(1):15-20.
14. El-Baba M, Corbett K, Dillon K, Heslop C. Medical Student POCUS Peer-to-Peer Teaching: Ready for Mainstream. Int J Med Students. 2021 Jan-Apr;9(1):11-4.
15. Rondilla NAO, Rocha ICN, Roque SJR, Lu RMS, Apolinar NLB, Solaiman-Balt AA, et al. Folk Medicine in the Philippines: A Phenomenological Study of Health-Seeking Individuals. Int J Med Students. 2021 Jan-Apr;9(1):25-32.
16. Juthani R, Gupta T, Basu D. Scatterplot Variations Seen in Malaria Using Automated Hematological Analyzers: A Series of Ten Cases. Int J Med Students. 2021 Jan-Apr;9(1):21-4.
17. Shand A. Childhood Adversity Linked to Neurological Circuitry Changes and Mental Health Disorders: A Narrative Review. Int J Med Students. 2021 JanApr;9(1):43-51.
18. Huang VP, Kim ME, Mohan S, Daskivich LP, Berry JL. The Utility of Recycled Eyeglasses: A Pilot Study at the Los Angeles County Department of Health Services Int J Med Students. 2021 Jan-Apr;9(1)37-40.
19. Nahian A, Sees JP. 8-Year-Old Child with Cerebral Palsy Treated with Pelvic Osteotomies Using 3.5 mm Blade Plate Having Subsequent Bilateral Implant Aseptic Loosening: A Case Report. Int J Med Students. 2021 Jan-Apr;9(1):52-5.
20. Olek, MJ, Bui, L. Medical Electronic Devolution. Int J Med Students. 2021 Jan-Apr;9(1):92-3.
21. Ali S, Murtaza MM. Combatting Misinformation During the COVID-19 Pandemic via Social Media. Int J Med Students. 2021 Jan-Apr;9(1):56-8.
22. Manfredini E. Providing Health Information on Social Media: What is the Limit for Medical Students? Int J Med Students. 2021 Jan-Apr;9(1):94-5.
23. Jayawardana HDP. Speaking Medicine in the Silent Language: Experience with a Deaf Patient in Sri Lanka. Int J Med Students. Jan-Apr Dec;9(1):59-60.
24. Rector D, Nowlen MA. Learning from Hispanic Mentees: A Reflection on Cultural and Socioeconomic Differences. Int J Med Students. 2021 Jan-Apr;9(1):73-4.
25. Soboka JG, Salamanca O, Calise A. My Experience with Orbis International and the Flying Eye Hospital in Ethiopia. Int J Med Students. 2021 Jan-Apr;9(1):68-70
26. Diebel SR. Cultural Placement: My Experience in a Remote Fly-in Indigenous Community in Northern Ontario, Canada. Int J Med Students. 2021 Jan-Apr; 9(1):86-7.
27. Yamamoto-Moreno, JA. Response to Letter to the Editor Regarding "Hypertension Awareness, Treatment, and Control in Mexico: An Opportunistic Medical Student-led Blood Pressure Screening Campaign – A Cross-Sectional Study". Int J Med Students. 2021 Jan-Apr;9(1):98-9.
28. García-Espinosa P. Letter to the Editor Regarding "Hypertension Awareness, Treatment, and Control in Mexico: An Opportunistic Medical Student-led Blood Pressure Screening Campaign – A Cross-Sectional Study". Int J Med Students. 2021 Jan-Apr;9(1):96-7.
29. Kelly K. The Vigil of Medicine. Int J Med Students. 2021 Jan-Apr;9(1):82-3.
30. Young K. Hurricane Kids: Impact of Socioeconomic, Public Health, Medical Education, and Natural Disasters on a Doctor in Training. Int J Med Students. 2021 Jan-Apr;9(1):84-5.
31. Găman MA, Ryan PM, Bonilla-Escobar FJ. To Stay at Port or to go to Sea: Are Clinical Clerkships a Double-Edged Sword during the COVID-19 Pandemic? Where do we go From Here?. Int J Med Students. 2002 May-Aug;8(2):92-95.
32. Esteller M. Epigenetics in evolution and disease. The Lancet (British edition). 2008 Dec 1;372:S90-S96

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Original Article

Medical Student POCUS Peer-to-Peer Teaching: Ready for Mainstream

Mazen El-Baba[1], Kathryn Corbett[1], Kate Dillon[1], Claire Heslop [1,2].

Abstract

Background: Point of care ultrasound (POCUS) is changing the face of clinical practice and medical education. Worldwide consensus based on expert opinion has advocated for POCUS teaching in undergraduate medical school curricula. Significant barriers, including lack of available instructors and limited resources, prevents medical learners from acquiring core competencies at most institutions. Here, we describe a peer-to-peer learning POCUS workshop and advocate for the use of this type of training to meet the demands of POCUS learning. **Methods:** A two-day POCUS workshop was held in Toronto, Ontario with twenty-six medical student participants. The workshop was structured according to a graduated model of POCUS skill development, beginning with didactic teaching, then progressing to hands-on peer-to-peer teaching, and finishing with competency evaluation by POCUS experts. Participants completed pre-and post-workshop surveys regarding prior POCUS teaching and exposure, self-reported skill development, and feedback on the workshop itself. **Results:** Of the 20 respondents to the questionnaire, 70% had prior POCUS exposure, with 85% of these individuals having less than 5 hours of prior POCUS education. Eighty-five percent of students reported that the organization of the course allowed them to participate fully, and 95% of participants indicated that peer-to-peer learning was effective. **Conclusion:** These findings suggest that peer-to-peer POCUS teaching is an effective learning method to acquire and consolidate well-established POCUS competencies. This initiative is scalable and could be applied to all learners in various disciplines. As such, we recommend medical schools consider integration of peer-to-peer POCUS teaching into longitudinal clerkship training programs, and transition-to-residency courses.

Key Words: Ultrasound; Education; Undergraduate Medical; POCUS; Peer-To-Peer (Source: MeSH-NLM).

Introduction

Point of care ultrasound (POCUS) – ultrasound applied at the bedside by a physician – has changed the face of acute care medicine with its diagnostic, screening, and therapeutic applications.[1,2] These include a reduction in: (1)time to diagnose and treat patients; (2) monitoring the effects of treatment and potential complications; (3) guiding diagnostic and therapeutic procedures; (4) and managing acutely ill patients.[2] When applied to answer specific clinical questions, POCUS has comparable sensitivities and specificities to other imaging modalities.[1,3,4] The versatility and applicability of POCUS has led to an increase in its application and use amongst physicians, residents, and medical students. Indeed, there has been an increase in the use of POCUS by medical professionals as an adjunct to physical examinations.[5]

Increased interest in applying POCUS in clinical settings has been met by an increased demand for teaching in ultrasound technical skills. Given that the advent of POCUS is relatively new when compared to other clinical skills (e.g., lung auscultation), the integration of POCUS learning objectives has lagged behind in most medical curricula. In an effort to change and modernize current medical training programs, expert consensus has established core POCUS competencies for medical training.[6,7] These have become the standard to ensure that baseline knowledge and skill are achieved by undergraduate medical students. Further, education experts recommend and advocate that POCUS teaching programs be integrated into medical curricula to meet the growing demands for POCUS skills.[6] However, limited instructor availability and institutional resources have hindered widespread training across all medical schools.[2]

To meet the growing demand for POCUS training, we propose a paradigm shift in education from traditional methods, such as didactic teaching and expert-to-student demonstrations. Instead, we propose the application of peer-to-peer learning, as it offers the advantages of scalability to large institutions and reduced instructor reliance without sacrificing the quality of education.[8,9] Peer-to-peer learning also benefits trainees, regardless of whether they are the tutors or learners, by improving their knowledge and practice of teaching skills.[8] Teaching peers allows medical students to improve their soft skills in communication and collaboration; thereby contributing to their development as effective future clinicians. Furthermore, peer-to-peer learning may also improve long term retention of new knowledge and skills.[9]

Peer-to-peer learning has already been implemented with success across various subject areas within medical school curricula, such as anatomy and histology.[9,10,11,12] Given its success in other areas of learning, we extended its applicability into POCUS training to meet teaching demand in a cost-effective manner. We designed learning modules that are conducive to a peer-to-peer teaching methodology based on expert POCUS objectives, and ran a two-day hands-on workshop. The primary focus of our educational initiative was to evaluate the effectiveness of peer-to-peer teaching as a POCUS learning method for medical students through a pilot POCUS workshop. Here, we discuss the details of our workshop and share pre-and post-survey results. Finally, we discuss implementation of peer-to-peer learning to larger POCUS training applications.

Methods

Description of the workshop

A two-day POCUS workshop was held in Toronto, Ontario with twenty-six medical student attendees. Workshop participation was voluntary, and not required to fulfil mandatory undergraduate medical objectives.

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Promotion of the workshop was conducted online using social media and e-mail, with spots allocated on a first-come-first-serve basis.

Workshop objectives

A comprehensive list of ultrasound objectives was developed in advance of planning workshop activities. The objectives were created based on the curricular elements recommended for inclusion in medical school ultrasound teaching[3]. Specifically, the objectives addressed physics and knobology, and specific ultrasound topics included: basic cardiac ultrasound, lung ultrasound, first trimester ultrasound, and ultrasound for abdominal aortic aneurysm, shock, and trauma.

Workshop organization

Our POCUS workshop combined didactic teaching that focused on fundamental ultrasound topics and ample hands-on peer-to-peer teaching. The modules that were created to facilitate the hands-on sessions were developed based on a graduated model of POCUS skill development. The workshop was concluded with a competency evaluation by POCUS experts to ensure that objectives were satisfactorily met.

In total, five hours were dedicated to didactic sessions, covering ultrasound physics and probe handling. Theory and scanning techniques for specific ultrasound exams were also reviewed for high-yield POCUS topics including: e-FAST, cardiac exam, volume assessment, abdominal aorta measurement, kidney assessment, and bladder volume assessment.

The remaining nine hours of the workshop were devoted to peer-to-peer teaching, with one ultrasound device and one standardized patient for each group of three students. The students used a learning manual which was provided to all participants in advance of the workshop. The manual contained step-by-step instructions for teaching POCUS techniques, including example images of normal and abnormal findings. The manual also contained questions to stimulate discussion, and resources for further learning. At the completion of each activity, students were asked to compare their knowledge against the learning objectives. Faculty organizers rotated between all student groups to ensure that peers were progressing on time and meeting all module objectives. Faculty advisors were also available to answer any questions that the peers may have had during their learning process. The final 2 hours of peer-to-peer teaching involved expert demonstration and competency assessment by instructors. Evaluators were provided with a checklist based on the learning manual to structure student self-evaluation.

Participants completed pre-and post-workshop surveys regarding prior POCUS teaching and exposure, self-reported skill development, and feedback on the workshop itself.

Participants and Instructors

Eligible participants were medical students in Ontario who had completed a minimum of one year of medical school. Students were asked to complete an online survey form to sign up for the workshop. The form gathered demographic information from the participants and assessed their past ultrasound experience. To ensure the anonymity of the participants, students were asked to complete an online form that was directly submitted to our cloud server. No identifiable information was gathered from participants to preserve their identity. Instructors were resident or staff physicians specializing in internal medicine or emergency medicine. All instructors had received formal POCUS training and had previous teaching experience.

Standardized Patients

Standardized patients (SPs) were available for students to scan during hands-on activities to maximize learning time for participants. Prior to beginning the workshop, all SPs were counselled on the risks of participating in the workshop and signed a consent form before proceeding.

Analysis

Descriptive analysis was performed using Excel. Survey data were organized based on survey items and response mean, standard deviation, and min/max values were calculated.

Results

Demographics

In total, twenty-six medical students attended the workshop from four medical schools across Ontario (54% University of Toronto, 19% Queen's University, 15% University of Ottawa, 12% University of Western Ontario). Participants had completed between one to three years of medical school (27% one year, 54% two years, 19% three years). Twenty students completed pre- and post-questionnaires, corresponding to a response rate of 77%. Demographic information is summarized in ***Table 1***.

Pre- and post-questionnaire analysis

Of the 20 respondents, 70% had prior POCUS exposure, with 85% of these individuals having less than 5 hours of exposure. 95% indicated that their participation in the workshop was due to interest in learning more about POCUS, and 85% indicated that they do not receive enough POCUS training elsewhere. Participant responses indicated that respondents viewed the clinical importance of POCUS as being either "Important" (30%), or "Very Important" (70%).

Pre-workshop measures demonstrated that most students (80%) felt that their level of skill/knowledge in POCUS was "Poor" or "Fair", while post-workshop measures showed improvement, with 80% indicating their level as "Very Good" or "Excellent". Ninety percent of respondents reported that the contribution of this workshop to their skills was "Very Good" or "Excellent". Further, with respect to the format of the learning, 85% of students reported that the organization of the course allowed them to participate fully, and 95% of participants indicated that peer-to-peer learning was effective.

Discussion

This pilot workshop was run as a proof of concept to assess medical student interest and participation in additional POCUS learning, beyond what is currently provided in undergraduate medical curricula, and to demonstrate the utility of peer-to-peer learning for POCUS training. The peer-to-peer learning format was positively received by participants and contributed to favorable learning outcomes. The workshop size was limited by availability of ultrasound machines, but with greater resources could be easily scaled-up.

The advent of bedside ultrasound continues to gain popularity amongst medical professionals at all levels given its clinical applicability in therapeutic management and diagnosis. The utility of POCUS relies heavily on the operator's experience and skill.[13] Indeed, similar to any learned skill, the operator is required to continuously practice using POCUS in order to maintain their level of competency and expertise. Although the number of physicians and residents using ultrasound is steadily increasing due to its widespread popularity, there still is a lack of training opportunities to meet the demands for POCUS teaching. One of the biggest challenges in widespread dissemination of POCUS teaching is expert availability to teach and limited institutional resources. These challenges are not unique to POCUS and have certainly been successfully circumvented in other areas of learning in medicine (e.g., anatomy) through the use of peer-to-peer teaching.

Peer-to-peer learning has many practical pedagogical advantages. First, this learning paradigm eliminates the reliance on experts to teach workshop objectives; thus, allowing more participants to enroll based on the space that is being utilized to run the learning activities. Second, peer-to-peer learning greatly reduces the cost of an ultrasound workshop by eliminating the cost associated with expert fees. Ultrasound workshops are notorious for being expensive given the prohibitive cost of enrolment. Third, peer-to-peer POCUS learning

Table 1. Descriptive Data of Pre-and Post-Measures.

Survey Items		Average	SD	Min	Max	n
Years of medical school completed		1.9	0.69	1	3	26
How important do you believe POCUS is as a clinical tool?*	Pre-workshop	4.4	0.72	3	5	23
	Post-workshop	4.7	0.47	4	5	20
How much did you learn?**	Level of skill/knowledge at start of workshop	2.0	1.15	1	5	20
	Level of skill/knowledge at end of workshop	4.0	0.76	2	5	20
	Level of skill/knowledge required to complete workshop	3.2	0.98	2	5	19
	Contribution of workshop to your skill/knowledge	4.6	0.82	2	5	20
Skill and responsiveness of instructors***	Presenter gave an effective lecture	4.9	0.37	4	5	20
	Presentations were clear and organized	4.9	0.37	4	5	20
	Presenter stimulated interest	4.9	0.31	4	5	20
	Instructors effectively used time during workshop	4.7	0.47	4	5	20
	Hands-on instructors were available and helpful	4.6	0.60	3	5	20
	Hands-on instructors provided useful feedback and guidance	4.7	0.47	4	5	20
Course content***	Learning objectives were clear	4.4	0.67	3	5	20
	Course content was organized and well-planned	4.4	0.75	2	5	20
	Course workload was appropriate	4.6	0.60	3	5	20
	Course was organized to allow all students to participate fully	4.6	0.76	2	5	20
	Peer-to-peer learning was effective	4.5	0.61	3	5	20

Legend: *1 = not at all important, 5 = very important. **1 = poor, 2 = fair, 3 = satisfactory, 4 = very good, 5 = excellent. ***1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

enables participants to spend more time interacting with the ultrasound machine and less time focusing on didactic learning. For instance, participants in our workshop spent two-thirds of the total workshop time (nine hours) completing hands-on modules. This allowed our participants to gain comfort in using the ultrasound probe and give each other feedback on areas of improvement when needed.

Peer-to-peer learning also has unique benefits from an educational standpoint. This method of learning allows the trainee to become the trainer; thus challenging the learner to interpret learning objectives in order to master the required materials.[8] Students are also given the opportunity to develop their teaching skills by sharing their POCUS knowledge and technique with their peers.[14,15] Having peers as teachers can provide a safe and inclusive space for learners to ask questions and address their learning concerns.[16] Further, peer-to-peer learning provides the trainees with the opportunity to improve other competencies that are essential to becoming successful clinicians including, collaboration, critical thinking, and communication.[11] When peer-to-peer learning is compared to faculty teaching in medical curricula, student outcomes were not shown to significantly differ.[15] With these added pragmatic and pedagogical benefits of peer-to-peer learning, we believe POCUS teaching should move toward a peer-to-peer model to meet the demands for learning and support the education of emerging clinicians.[17]

Peer-to-peer learning also has potential drawbacks that require mention to ensure that workshop organizers have strategies to overcome challenges that arise. Peer-to-peer learning relies on all trainees being equally motivated to participate in order to have an enriched learning experience. Not all trainees will be comfortable teaching their peers or taking an active leadership role in teaching a set of objectives. Anecdotally, one strategy that we implemented in our workshop to overcome this challenge was having the faculty organizers rotate amongst the groups to ensure that participants were on track and meeting the modules' objectives. The faculty organizers were available to provide guidance to any trainees who were having difficulty leading peer-to-peer teaching. Another potential challenge in peer-to-peer learning is pairing trainees based on complementary strengths and weaknesses.[16] Although this challenge is hard to overcome, we found that all trainees effectively collaborated with one another and relied on their interpersonal skills to effectively communicate and meet the workshops' objectives. Finally, peer-to-peer learning introduces challenges in quality assurance of the individual's learning experience. To ensure an equal quality of learning across all groups, we developed a competency checklist that was administered by trained faculty at the end of the workshop. This provided affirmation to trainees that they had gained competencies to the level of a pre-set standard during the course of the weekend.

The results of this pilot program demonstrate that students view POCUS as a clinically important tool and perceive a need for additional POCUS training in undergraduate medical education. Further, these findings suggest that the use of peer-to-peer POCUS learning was positively viewed by medical learners and provided favorable learning outcomes based on participants' subjective experience. Our results also suggest that peer-to-peer learning is a promising practical solution to ensure that learners have sufficient scanning time for deliberate practice — an integral component to skill acquisition and competency in POCUS.[18, 19]

Limitations

This workshop's small sample size is the first limitation that needs to be addressed as it hinders the generalizability of the findings. Further, students participating in the workshop sought out and voluntarily enlisted to learn about POCUS. This may indicate a similar, heightened baseline interest in learning and advancing their POCUS knowledge and skills. Therefore, participants' attitudes towards the workshop may be favorably biased compared to a general medical student cohort. However, these two limitations can be overlooked in this pilot study as our aim was to provide a framework of a POCUS educational initiative that has the potential to be expanded to meet teaching demands. To overcome this limitation, POCUS workshops affiliated with undergraduate curricula should integrate a peer-to-peer training component. This strategy would diversify the students participating in the peer-to-peer program as the sample of peers will include participants with varied interests, past knowledge, and skill in using ultrasound.

Another limitation of our initiative is the lack of objective pre- and post-measures that would assess the evolution of the participants knowledge and skill. Such measures can be implemented in future workshops to evaluate the participant's progress throughout the learning activities. For our initiative, we focused on ensuring that the

participants met a knowledge and skill threshold in accordance with the competency checklist designed by the University of Toronto POCUS committee. Lastly, all POCUS learning was conducted on standardized patients who had normal physiology. In real clinical settings, medical learners will be under various pressures, including but not limited to uncooperative patients, time pressures, and varying body types. Thus, the participant's perceived POCUS skills post-workshop may not accurately reflect their actual comfort level in a clinical environment. Standardized settings offer students the opportunity to practice, make mistakes, and ask questions in a safe and inclusive space. Arguably, these standardized opportunities are equally important to clinical practice as they provide learners with the foundational knowledge and experience to clinically apply their POCUS skills.

Conclusion

This workshop represents the first application of peer-to-peer learning in undergraduate POCUS instruction. The results show that peer-to-peer teaching may be an effective method for medical students to acquire and consolidate well-established POCUS competencies.[3] Our model provides a cost-effective means of offloading instructor demands and permitting rapid dissemination of foundational POCUS skills across entire medical classes. Future directions for this project will include validation of the curriculum and the collection of objective competency measurements. This initiative is scalable and could be applied to learners at all skill levels. As such, we believe future endeavours should explore the integration of peer-to-peer POCUS teaching into longitudinal clerkship training programs, or transition-to-residency courses in undergraduate medical institutions.

References

1. Moore CL, Copel JA. Point-of-Care Ultrasonography. N Engl J Med. 2011;364(8):749–57.
2. Leidi A, Rouyer F, Marti C, et al. Point of care ultrasonography from the emergency department to the internal medicine ward: current trends and perspectives. Intern Emerg Med. 2020;15(3):1-14.
3. Lee SH, Yun SJ. Diagnostic performance of emergency physician-performed point-of-care ultrasonography for acute appendicitis: A meta-analysis. Am J Emerg Med. 2019;37(4):696-705.
4. Chartier LB, Bosco L, Lapointe-Shaw L, et al. Use of point-of-care ultrasound in long bone fractures: a systematic review and meta-analysis. CJEM. 2017;19(2):131-142.
5. Smallwood N, Dachsel M. Point-of-care ultrasound (POCUS): unnecessary gadgetry or evidence-based medicine?. Clin Med (Lond). 2018;18(3):219-224.
6. Ma IWY, Steinmetz P, Weerdenburg K, et al. The Canadian Medical Student Ultrasound Curriculum. J Ultrasound Med. 2020;64(10):e462-e467.
7. Torres-Macho J, Aro T, Bruckner I, et al. Point-of-care ultrasound in internal medicine: A position paper by the ultrasound working group of the European federation of internal medicine. Eur J Intern Med. 2020;73:67-71.
8. Dandavino M, Snell L, Wiseman J. Why medical students should learn how to teach. Med Teach. 2007;29(6):558–65.
9. Harrison CH, Elmansouri A, Parton W, et al. The Efficacy of Frontline Near-Peer Teaching in a Modern Medical Curriculum. Anat Sci Educ. 2019;12(3):236-244.
10. Durán CEP., Bahena EN, Rodríguez, MDLÁG, et al. Near-peer teaching in an anatomy course with a low faculty-to-student ratio. Anat Sci Educ. 2012;5(3):171-176.
11. Stigmar M. Peer-to-Peer teaching in higher education: A critical literature review. Mentoring & Tutoring: partnership in learning. 2016;24(2):124-136.
12. Evans DJ, Cuffe T. Near-peer teaching in anatomy: An approach for deeper learning. Anat Sci Edu. 2009;2(5):227-233.
13. Bhagra A, Tierney DM, Sekiguchi H, et al. Point-of-Care Ultrasonography for Primary Care Physicians and General Internists. Mayo Clin Proc. 2016;91(12):1811-1827.
14. Marton GE, McCullough B, Ramnanan CJ. A review of teaching skills development programmes for medical students. Med Educ. 2015;49(2):149-160.
15. Rees EL, Quinn PJ, Davies B, et al. How does peer teaching compare to faculty teaching? A systematic review and meta-analysis. Med Teach. 2016;38(8):829–37.
16. Olaussen A, Reddy P, Irvine S. Peer-assisted learning: time for nomenclature clarification. Med Educ Online. 2016;21(1):30974.
17. Nestel D, Kidd J. Peer assisted learning in patient-centred interviewing: the impact on student tutors. Med Teach. 2005;27(5):439-444.
18. Lewis D, Rang L, Kim D, et al. Recommendations for the use of point-of-care ultrasound (POCUS) by emergency physicians in Canada. CJEM. 2019;21(6):721-726. doi:10.1017/cem.2019.392
19. Cartier RA, Skinner C, Laselle B. Perceived Effectiveness of Teaching Methods for Point of Care Ultrasound. J Emerg Med. 2014;47(1):86-91.

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Original Article

Case series: Point-of-Care Ultrasound Conducted by Medical Students During their First Clinical Rotation Changes Patients' Primary Diagnosis and Management

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Abstract

Background: As point-of-care ultrasound (POCUS) becomes a standard of care procedure, medical schools around the world have started to seek the integration of POCUS courses into their curricula. This puts medical students in a unique position as they are trained in an area in which many physicians lack knowledge. This case series provides a glimpse into the capabilities of POCUS even when used by medical students. **Methods:** Fourth-year medical students at Ben-Gurion University of the Negev performed numerous POCUS exams during their first clinical rotation at Soroka University Medical Center in Israel. All students completed a course in basic POCUS training and were evaluated in a brief practical exam before entering their first clinical rotation. Four of the cases in which the students took part are presented in this case series. **Results:** The POCUS exam in the first case discovered pulmonary embolism in addition to the diagnosis of Cushing disease. In the second case, endocarditis could have been diagnosed three days earlier had a POCUS exam been performed. Case 3 demonstrates the additional contribution of POCUS to the decision-making process carried out by physicians and its superiority in quantifying and diagnosing pleural effusion compared to chest X-Ray. Case 4 indicated that POCUS is preferable over chest X-ray and auscultation for the diagnosis of pulmonary edema. **Conclusion:** This case series may emphasize the capabilities POCUS has when utilized in the standard physical examination and the importance of incorporating POCUS instruction in medical schools for new physicians to acquire this skill.

Key Words: Point of Care Ultrasound; Internal medicine; Medical Education; Pulmonary embolism; Pulmonary edema (Source: MeSH-NLM).

Introduction

Medical education is constantly challenged to keep up with the advances in medical technology.[1] Point of care ultrasound (POCUS), a rapidly evolving area in medicine, has become an integral element of the physical examination, leading to its integration in medical schools' curricula.[2]

The advantages of POCUS have been demonstrated in numerous studies.[3–7] Utilizing ultrasound at the bedside as a means of enhancing the physical examination by providing immediate clinical information, in turn aids the physician in building a diagnosis and assists in the clinical decision-making process. Previous data reports that POCUS can result in shorter time to diagnosis among dyspneic patients; reduced duration of mechanical ventilation; shortened length of stay in intensive care units; and expedited discharge time among heart failure patients when used in tailoring diuretics therapy.[8–10] Additionally, POCUS exams are easily repeatable as the patients' condition evolves, providing rapid feedback as an evaluative tool in the treatment plan.

As POCUS is an operator-dependent modality, it is essential that the POCUS operator is highly skilled to correctly achieve the different ultrasound views and interpret them accurately. Hence, the concept of introducing POCUS training as early as during medical school is key. Indeed, medical schools around the world seek to integrate POCUS courses into their curricula.[11,12] Many efforts are devoted to building POCUS training programs as well as evaluating which materials are fundamental for training. Dinh et al. defined milestones in training medical students to perform POCUS.[13] A modified Delphi technique was used to identify milestones in the study of clinical ultrasound among fourth-year medical students. Out of 214 proposed milestones, 90 were chosen as the main milestones. Primarily in ultrasound physics and machine use were 27 milestones (30%), 13 milestones in cardiology (14.4%), 11 in thoracic (12.2%) and 6 milestones in abdominal ultrasound (6.7%).[13] Another study developed a novel four-year-long vertical curriculum: During the first two years of medical school, students are taught basic ultrasound science and image acquisition.[14] In the following two years, students are trained in ultrasound indications and interpretation.[14,15]

Ben-Gurion University of the Negev (BGU) has become invested in educating its medical students to perform POCUS at a sufficient level of expertise. As of 2017, each class takes an eight-hour-long POCUS course taught by senior intensive care unit (ICU) physicians and cardiologists. The purpose of the course is to integrate POCUS into the physician's daily practice and to teach how to improve the traditional physical examination utilizing the POCUS exam.[16] Throughout the course, medical students are trained to perform ultrasound exams in echocardiography as well as focus assessment sonography in trauma (FAST) exams and lung ultrasound. The course is mandatory, and each class is comprised of 120 students who are later dispersed to clinical rotations in the internal medicine wards. In total, around 480 students

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underwent the POCUS course. The integration of POCUS into the Ben-Gurion medical school curriculum commenced in 2017, therefore the effects of this process on patient management and outcomes has yet to be studied in our institution. This POCUS course is unique in medical training in Israel. No other faculty in the country trains students to conduct a full cardiac POCUS examination.

As part of today's medical curricula, recently graduated physicians acquire POCUS skills that senior doctors may not possess, thus putting the former in a unique position. Senior medical staff might not be familiar with POCUS or have the awareness of the advantages this resource provides in early diagnosis and treatment. This situation creates fertile ground for recently graduated medical staff and students to provide significant added value in the clinical practice. A skilled POCUS operator can be a source of knowledge to the rest of the medical staff, despite a lack of vast clinical experience.

We have thus sought to describe certain cases where the use of POCUS augmented the physical examination and changed the primary patient diagnosis and management. The objective of this case series is to provide a glimpse into the capabilities of POCUS even when used by medical students.

Methods

Study Population and Time Frame

This case series was initiated retrospectively by 3 fourth-year medical students at Ben-Gurion University in Be'er Sheva, Israel, who recorded their POCUS exams during their internal medicine rotation. The rotation took place over three months, during clinical rotations in an internal medicine ward, between March and June of 2018. All students underwent a cardiac POCUS course prior to the rotation.

Pre-internal Medicine Rotation POCUS Course

All fourth-year medical students from the BGU six-year-long medical school program receive POCUS training before arriving at their first clinical rotation. The training focuses mainly on the principle of transthoracic echocardiographic views providing the capability to perform and analyze all basic cardiac ultrasound views.

Training includes:

- A two-hour-long lecture of cardiac ultrasound anatomy
- two hours of cardiac ultrasound pathologies interpretation
- four hours of hands-on training of cardiac ultrasound and
- two hours of lung ultrasound views, including pathologies and focused assessment sonography for trauma (FAST) performance and interpretation.

Students practiced on cardiac and lung simulators and on their colleagues using pocket and cardiovascular ultrasound devices (Simbionix Simulator, Vscan and Vivid S70 GE Healthcare). At the end of the 10-hour course students' proficiency was evaluated based on a 6-minute views test described elsewhere.[16]

Internal Medicine Ward Rounds

During the fourth year of a six-year medical school program, all students rotate through internal medicine for three months. This is their first clinical rotation and was taken in various wards at Soroka University Medical Center (SUMC), a large tertiary medical center in Israel's southern region. Among their rotation obligations, students are required to take part in rounds, obtain medical history, perform physical examinations and write admission notes on patients admitted to the internal medicine ward from the emergency department, all under the supervision of an internal medicine attending physician or resident. Most student-patient interactions took place after the patient was already examined by the primary team and the first diagnostic and treatment plan was established.

Students Performing POCUS During Their First Clinical Rotation

Students were encouraged to incorporate POCUS in their first patient assessment as part of the physical examination. After the students completed the admission process, they were required to present their patients to the medical resident taking care of the patient as well as presenting the POCUS findings to ultrasound experts at the time of the examination or via recorded video of the examination, when available. The ultrasound device used in the cases presented in this study was a Vscan-GE healthcare. In most internal medicine wards, physicians were not trained in POCUS, a skill which the students, who underwent a professional POCUS course recently introduced at BGU medical school, had acquired. The physicians presented in this study did not go through similar training.

Ethical Approval

All participants signed an informed consent form approving the information written in this manuscript.

Results

In this case series, we will present four cases in which medical students contributed to the assessment and treatment of their patients by adding important clinical findings as a direct result of POCUS (***Table 1***).

Table 1. Patients' presentations and POCUS findings.

Case	Presentation/ Preliminary Diagnosis	Student POCUS finding*	Pt new diagnosis	Management Change
1	Effort dyspnea, presumed secondary to Cushing's Syndrome	Enlargement of right ventricle Right ventricle hypokinesis	Bilateral PE	Prompt CTA exam was ordered followed by anticoagulation treatment.
2	Fever of unknown origin (FUO)	Vegetation on mitral valve	Mitral valve endocarditis was identified 4 days before formal TTE	Proper endocarditis antibiotic treatment was started 4 days earlier rather than empiric antibiotic treatment for FUO
3	Dyspnea, presumed to be secondary to large pleural effusion	Lung ultrasound revealed only small amount of pleural effusion and ultrasonographic signs of pulmonary congestion	Pulmonary congestion	Thoracentesis was deferred and diuretics for lung congestion were initiated
4	Dyspnea of unknown cause	Multiple bilateral B lines and no imaging of lung consolidation	Pulmonary edema	Initiation of Furosemide treatment

**** All findings were unknown prior to the students' POCUS exam***

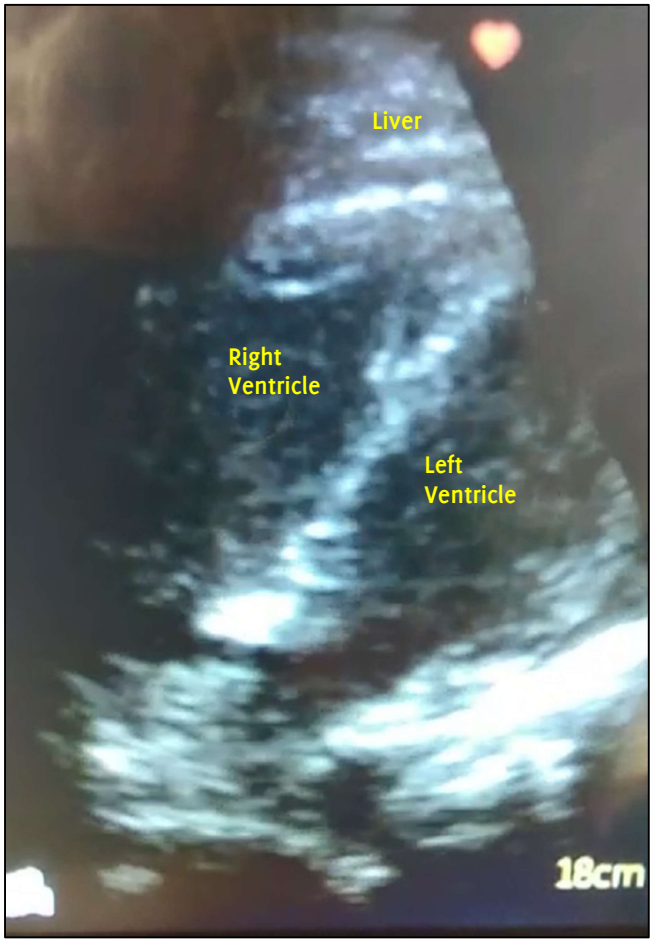
Case 1

A 40-year-old female with a medical history of hypertension was admitted one month before the current admission with shortness of breath, hirsutism, and amenorrhea. The patient had a work-up for Cushing Syndrome and high 24-hour urine cortisol levels were detected. She was readmitted due to effort dyspnea and dizziness, presumably unrelated to the diagnosis of Cushing Disease which was defined as her primary diagnosis. During the current admission additional tests

were ordered, including a head CT and chest X-ray (CXR). Ophthalmology and neurology evaluations were ordered as well.

She was examined by a fourth-year student during their first clinical rotation. The student performed a physical examination revealing bilateral leg edema with no erythema, tenderness or palpable chords and no findings in heart and lung auscultation. Vital signs were normal except for high blood pressure. In addition, the student performed a POCUS study revealing significant global right ventricular (RV) hypokinesis and enlargement that was not known to the primary team. (***Figure 1***). Furthermore, the left ventricle (LV): RV ratio was reversed (RV bigger than the LV). The medical team was notified by the student; the POCUS findings, concomitant leg edema, and relative immobilization raised the concern for a pulmonary embolism. A pulmonary CT angiography test was ordered, revealing significant bilateral pulmonary embolisms. Appropriate treatment was initiated. Three days later, the patient improved significantly and was discharged from the medical center.

Figure 1. Subcostal view showing enlarged right ventricle (RV).



Case 2

A 19-year-old female with no previous medical history was admitted to the internal medicine ward with persistent fever for two weeks reaching 40 degrees Celsius, which was treated with antipyretics. On her physical examination, the patient seemed lethargic with the only major clinical finding being a systolic murmur 3/6 radiating to the mid-axillary area. A transthoracic echo (TTE) was ordered (scheduled for a future date) and empiric antibiotic therapy with ceftriaxone was initiated due to fever of unknown origin.

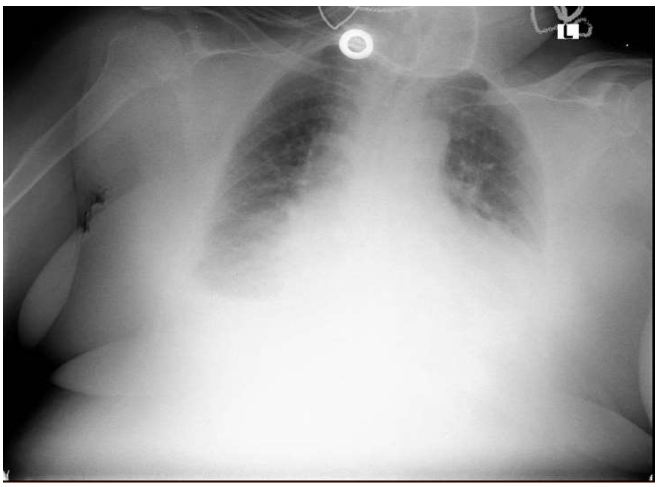
A fourth-year medical student in their first clinical rotation, performed a physical examination augmented by POCUS study on the patient's first day of admission. The student identified a small mobile mass on the mitral valve using POCUS. The primary team was notified, multiple blood cultures were taken, and proper endocarditis antibiotic therapy was initiated.

Due to technical reasons, only on the fourth day of admission was the formal TTE study conducted. At this point in time, the patient was formally diagnosed with endocarditis and continued the previously subscribed systemic endocarditis antibiotic therapy.

Case 3

An 84-year-old female with a medical history of congestive heart failure (CHF) and uncontrolled hypertension was admitted due to dyspnea and productive cough which started three days prior to her admission. Decreased breathing sounds were auscultated over the left lower lung. AP chest X-ray was interpreted as consistent with a large volume left sided pleural effusion (***Figure 2***). The patient's diagnosis was CHF exacerbation due to uncontrolled hypertension. In addition to the standard treatment for CHF exacerbation, the medical team deduced that the significant pleural effusion found on the chest X-ray contributed to the patient's dyspnea and therefore was scheduled for non-image-guided left side thoracentesis.

Figure 2. Chest X-ray showing significant left-sided effusion concealing the cardiac silhouette, and blunting of the right costophrenic angle suggesting a small right-sided effusion.



A fourth-year medical student, in his first clinical rotation, performed a physical examination augmented by POCUS study. The student's examination contradicted the chest X-ray, finding only a small amount of pleural effusion which is presented as a small restricted black area (representing fluid) above the diaphragm. Findings were reported to the primary team. This finding was later verified by an internist with POCUS experience. Due to the student's findings, thoracentesis was cancelled. Treatment with diuretics was initiated and the patient improved significantly.

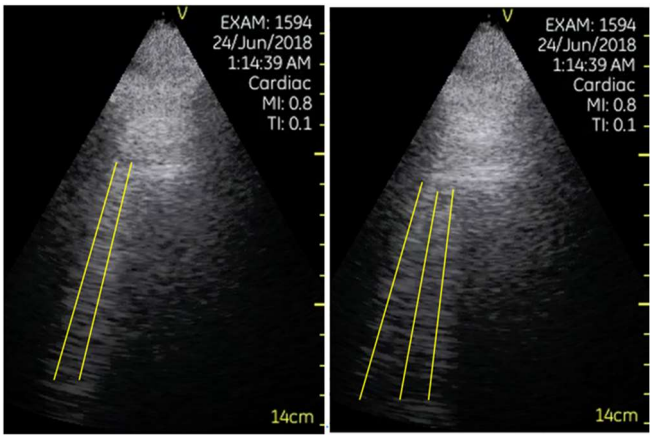
In this case, an unnecessary invasive action was prevented due to the presence of an ultrasound operator. The chest X-ray evaluation suggested a large left-sided pleural effusion. Even though chest X-rays are notoriously inaccurate in evaluating the volume of pleural effusions they are sometimes used due to the lack of more specific techniques. However, the presence of a fourth-year medical student with basic POCUS skills presented an alternative option and gave a more accurate reading of a small pleural effusion, which did not require a thoracentesis.

Case 4

An 86-year-old male with hypertension was admitted to the emergency room (ER) with a chief complaint of dyspnea at rest that started the previous evening. The patient was tachycardic (heart rate was approximately 100 beats per minute) and tachypneic (respiratory rate of 24 breaths per minute) with a temperature of 37.8 degrees Celsius. Chest X-ray taken in the emergency ward was inconclusive, showing mild infiltrates on the bases of both lungs. The patient was admitted to the internal medicine ward for further evaluation and treatment.

On day one of admission, neither history taking nor physical examination, conducted by the resident, clarified the diagnosis or reason for dyspnea. The patient was known to suffer from hypertension, tobacco use, lack of exercise and had no recent contact with sick people. The physical examination did not show jugular vein distention or peripheral edema; however, on auscultation soft crackles were heard. Hence, along with sub-febrile temperature, new dyspnea and the presented information, the possibility of pneumonia and pulmonary congestion secondary to heart failure was listed in the differential diagnosis. At this point, a lung POCUS exam was performed by a fourth-year medical student in their first clinical rotation as part of the physical examination of the patient. The student found multiple ultrasonographic B lines (***Figure 3***), pleural effusions (***Figure 4***) in the bases of both lungs, and a non-collapsible IVC (***Figure 5***). No lung hepatization or dynamic air bronchograms were present. Therefore, combining data from the chest X-ray and POCUS of the lungs, lung consolidation was ruled out and lung edema was diagnosed. The primary team initiated furosemide treatment based on the lung POCUS findings and the patient improved significantly. Further investigations suggested that the pulmonary edema was a result of poor compliance to his hypertension and heart failure treatment.

Figure 3. Mid-axillary view of the base of the lungs demonstrates three B-Lines and more.



Discussion

In this study we presented four cases in which medical students with basic POCUS skills were able to change the primary diagnosis as well as the treatment plan of newly admitted patients in internal medicine wards. Physicians use multiple resources to promote a timely diagnosis and appropriate treatment. Lacking knowledge in POCUS deprives both the physician and the patient of a valuable diagnostic tool for patient evaluation and appropriate treatment.

We practice medicine in a transitional time where POCUS has entered the curriculum of some medical schools, but many senior and experienced physicians do not hold this new bedside capability. This creates a reality where medical students can use ultrasound to 'see into their patients' when other physicians may only be comfortable to auscultate, palpate or percuss.[10,17]

Figure 4. Fluid between the pleural membranes.

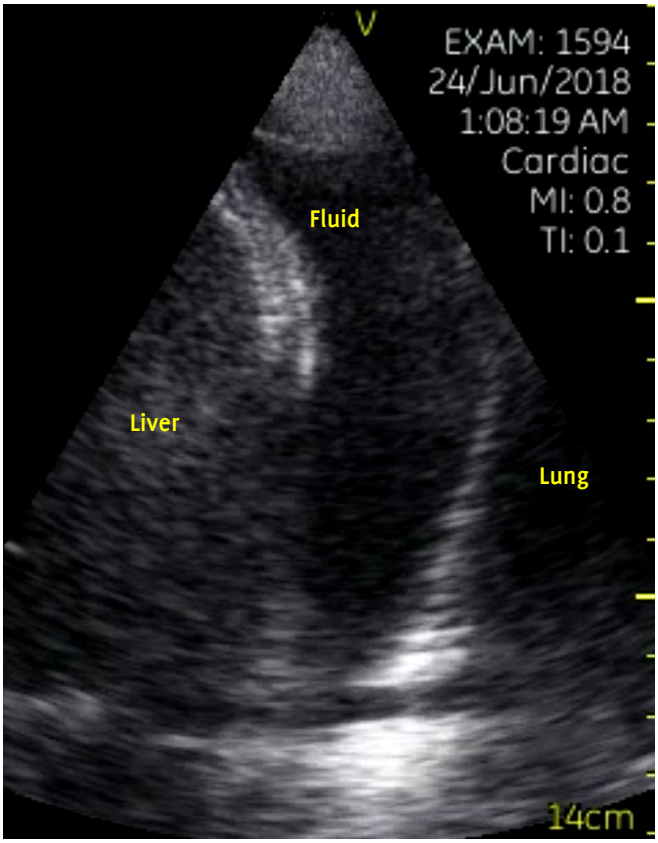
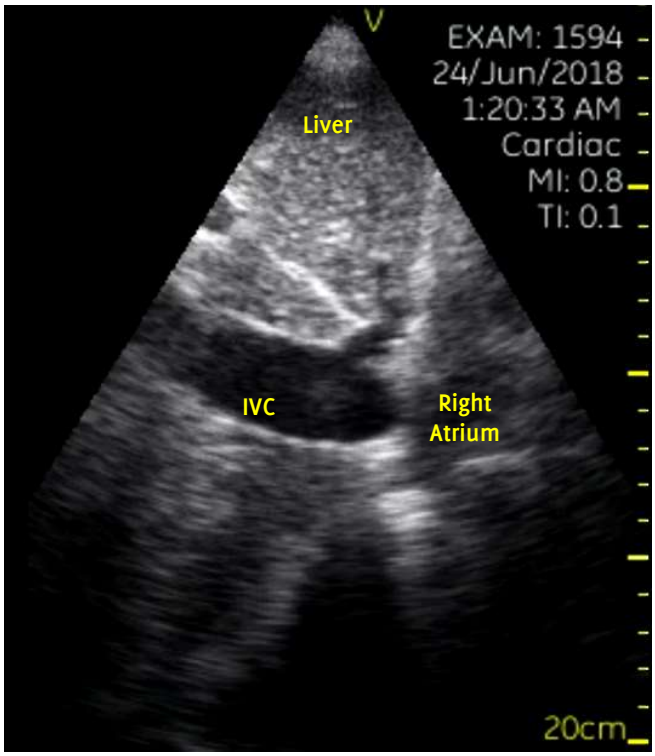


Figure 5. Non-collapsible inferior vena cava (IVC).



In all four cases, patients received thorough assessment by a number of senior physicians prior to the students POCUS exam. However, the traditional clinical tools used by the physicians did not suffice, and the final diagnosis of the condition was reached through a POCUS examination conducted by one of the students. The POCUS examination conducted by the students produced critical information that reduced the time to correct diagnosis and changed the course of treatment.

It is worth mentioning that the clinical role of POCUS is not to make a definitive diagnosis. POCUS is meant to accelerate the process of diagnosis and treatment and assist in the decision-making process.[18,19] As seen in the cases presented, POCUS examination conducted by the students led to faster diagnosis and treatment. When necessary, the POCUS examination was followed by a definitive gold standard test which confirmed the findings found on the POCUS examination.

In case 1, performing a POCUS exam during the patient's first dyspnea admission, one month earlier, would probably have led to an earlier discovery of the PE, a life-threatening disease, thus saving the patient from a month of symptoms, another admission and potentially her life.

Case 2 is an example of how POCUS might provide information leading to the proper diagnosis and appropriate antibiotic treatment three days earlier. In this case of fever of unknown origin versus final diagnosis of endocarditis, time to proper antibiotic therapy may have been crucial. Ideally, the patient should have received diagnostic transthoracic echocardiography immediately after the cardiac murmur was discovered; but in the real medical world, days can often elapse from admission to the proper diagnostic study.

Case 3 is an example of how a POCUS exam contributed to the physicians' confidence in their decision-making process. An additional, objective observation is sometimes critical and may spare harmful procedures.

In Case 4, the POCUS exam had a significant effect on the course of treatment and demonstrated superiority over chest X-ray and auscultation for the diagnosis of pulmonary edema. In 2004, Liechtenstein D. et al compared auscultation, chest X-ray and lung ultrasound in acute respiratory distress syndrome (the most acute form of pulmonary edema) and showed far better sensitivity with lung ultrasound compared to chest X-ray and auscultation (93%, 68% and 8% respectively).[20] Ten years later, Al Deeb et al showed in their meta-analysis that the sensitivity and specificity of POCUS using B-lines to diagnose pulmonary edema is 94.1% and 92.4% respectively.[21] In the presented case, the primary team could not determine whether the dyspnea was a result of pulmonary congestion or pneumonia, and without the availability of a POCUS exam the patient would probably have gone through many more tests and exams, delaying symptomatic relief.

The concept of 'ultrasound stethoscope' is rapidly moving from theory to reality.[11,22] Our fourth-year students, having better training in POCUS over the more senior in-house physicians and residents with no POCUS experience at all were able to significantly alter the diagnosis and improve the treatment of their patients. There are many difficulties in the process of teaching POCUS to medical students: it is an operator-dependent modality necessitating small-group bedside teaching, it is sometimes opposed by senior traditional medical staff, condensed medical school curriculums, lack of available POCUS experts, lack of mobile ultrasound machines and more. However, like other recent studies, this case series demonstrates the importance of developing medical schools' curriculum in this field.[23,24]

Garnier et al. presents an example of the impact POCUS courses have when incorporated in medical schools, describing the impact of a pilot emergency medicine ultrasonography course on medical students' knowledge.[25] They demonstrated a significant improvement in ultrasound knowledge improving the total score in an ultrasound questionnaire test from 59.7% correct answers before the course to 86% after. In addition, after the course 96.5% of participants were able to complete an extended FAST scan. Other medical schools should also adopt and develop novice tools to teach students the art of the new augmented bedside physical examination. To overcome the difficulties of teaching POCUS and minimize the disadvantage of this modality as an operator-dependent skill, we believe students at the beginning of their POCUS experience should be accompanied by POCUS mentors, with whom they may discuss specific cases and can consult regarding different findings, so that the right conclusions will be made and to avoid misdiagnoses. We think courses should start early in medical education, in anatomy classes the ultrasound can facilitate an understanding of topographic anatomy, while incorporating, for example, cardiac ultrasound anatomy sessions.[26] In addition, cardiac ultrasound courses should be incorporated in physical examination classes and shock cases. Nevertheless, there are many setbacks preventing POCUS from becoming an inherent part of modern medicine worldwide; POCUS training is extremely time consuming and requires many resources as compared with other subjects taught in medical schools. Since POCUS is a manual skill, hands-on training must be taught in small groups; this requires proper facilities, paid models to simulate patients, ultrasound devices, and tutors who are usually physicians or senior students. Ohio State University College of Medicine reports major challenges in funding POCUS training due to the high cost of ultrasound machines and difficulties integrating the new curricula into existing teaching methodologies. [14] The University of South Carolina integrated an ultrasound curriculum taught throughout four years of medical school, and reported similar difficulties in terms of faculty experience, administrative and clinical specialty support, and available resources.[15]

In order to overcome these difficulties in our faculty, we train students to teach and train other students in POCUS, saving money and time from senior physicians teaching hours. Web-based applications are trying to be used for POCUS self-learning.[16] Our faculty purchased a number of second-hand ultrasound machines and a simulator which can simulate many different clinical pathologies and clinical scenarios enabling students to practice on their own time.

Comprehensive POCUS training will contribute to our next generation of physicians, significantly improving their bedside diagnostic capabilities, shortening time to definitive treatment, and improving overall patient care.[9–11]

This study took place before the COVID-19 outbreak. However, it is worth noting that in addition to the everyday advantages of POCUS such as being an accessible and easy-to-operate tool that does not expose patients to radiation, POCUS is also valuable when considering its low risk of infection. POCUS may reduce the exposure and risk of infection in comparison to a CT scan or a chest X-ray, in which the patient is required to move around the hospital or be exposed to machines which can be difficult to disinfect.[27]

As this study is a case series, the main limitations of this study include the small sample size and retrospective, not longitudinal data collection. This limits our understanding of the impact of medical students trained in POCUS.

Conclusion

Medical students in their first clinical rotation were able to change diagnoses of four internal medicine ward patients when incorporating POCUS to the traditional physical examination. Their findings altered medical therapy and management. There is a knowledge gap between medical students receiving POCUS training and more senior physicians who have not received training in POCUS. Efforts should be made to close this gap and to further incorporate POCUS teaching in medical schools as well as for more senior physicians.

References

1. Harden RM. Ten key features of the future medical school—not an impossible dream. Med Teach. 2018 Oct;40(10):1010-1015.
2. Kobal SL, Lior Y, Ben-Sasson A, Liel-Cohen N, Galante O, Fuchs L. The feasibility and efficacy of implementing a focused cardiac ultrasound course into a medical school curriculum. BMC Med Educ. 2017 May;17(1):1–9.
3. Labovitz AJ, Noble VE, Bierig M, Goldstein SA, Jones R, Kort S, et al. Focused cardiac ultrasound in the emergent setting: A consensus statement of the American society of Echocardiography and American College of Emergency Physicians. J Am Soc Echocardiogr. 2010 Dec;23(12):1225–30.
4. Cortellaro F, Colombo S, Coen D, Duca PG. Lung ultrasound is an accurate diagnostic tool for the diagnosis of pneumonia in the emergency department. Emerg Med J. 2012 Jan;29(1):19–23.
5. Reissig A, Copetti R, Mathis G, Mempel C, Schuler A, Zechner P, et al. Lung ultrasound in the diagnosis and follow-up of community-acquired pneumonia: A prospective, multicenter, diagnostic accuracy study. Chest. 2012 Oct;142(4):965–72.
6. Zanobetti M, Poggioni C, Pini R. Can chest ultrasonography replace standard chest radiography for evaluation of acute dyspnea in the ED? Chest. 2011 May;139(5):1140–7.
7. Zanobetti M, Scorpiniti M, Gigli C, Nazerian P, Vanni S, Innocenti F, et al. Point-of-Care Ultrasonography for Evaluation of Acute Dyspnea in the ED. Chest. 2017 Jun;151(6):1295–301.
8. Girard M, Migner-Laurin G. Time for a New Consensus on Lung Ultrasonography. Chest. 2016 Oct;150(4):986–7.
9. Chen Z, Hong Y, Dai J, Xing L. Incorporation of point-of-care ultrasound into morning round is associated with improvement in clinical outcomes in critically ill patients with sepsis. J Clin Anesth. 2018 Aug;48(3):62–6.
10. Mozzini C, Di Dio Perna M, Pesce G, Garbin U, Fratta Pasini AM, Ticinesi A, et al. Lung ultrasound in internal medicine efficiently drives the management of patients with heart failure and speeds up the discharge time. Intern Emerg Med. 2018 Jan;13(1):27–33.
11. Solomon SD, Saldana F. Point-of-Care Ultrasound in Medical Education — Stop Listening and Look. N Engl J Med. 2014 Mar;370(12):1083–5.
12. Rao S, Van Holsbeeck L, Musial JL, Parker A, Bouffard JA, Bridge P, et al. A pilot study of comprehensive ultrasound education at the Wayne State University School of Medicine: A pioneer year review. J Ultrasound Med. 2008 May;27(5):745-9.
13. Dinh VA, Lakoff D, Hess J, Bahner DP, Hoppmann R, Blaivas M, et al. Medical student core clinical ultrasound milestones: A consensus among directors in the United States. J Ultrasound Med. 2016 Feb;35(2):421–34.
14. Bahner DP, Adkins EJ, Hughes D, Barrie M, Boulger CT, Royall NA. Integrated medical school ultrasound: Development of an ultrasound vertical curriculum. Crit Ultrasound J. 2013 Jul 2;5(1):6.
15. Hoppmann RA, Rao V V., Poston MB, Howe DB, Hunt PS, Fowler SD, et al. An integrated ultrasound curriculum (iUSC) for medical students: 4-year experience. Crit Ultrasound J. 2011 Apr;3(1):1-12.
16. Fuchs L, Gilad D, Mizrakli Y, Sadeh R, Galante O, Kobal S. Self-learning of point-of-care cardiac ultrasound - Can medical students teach themselves? PLoS One. 2018 Sep;13(9):1–12.
17. Narula J, Chandrashekhar Y, Braunwald E. Time to add a fifth pillar to bedside physical examination inspection, palpation, percussion, auscultation, and insonation. JAMA Cardiol. 2018 Apr;3(4):346–50.
18. Smith D, Walters EL, Reibling E, Brockie D, Lee C, Neeki M, et al. Unified: Understanding new information from emergency departments involved in the San Bernardino terrorist attack. West J Emerg Med. 2020 Feb;21(2):382–90.
19. Kovell LC, Ali MT, Hays AG, Metkus TS, Madrazo JA, Corretti MC, et al. Defining the Role of Point-of-Care Ultrasound in Cardiovascular Disease. Am J Cardiol. 2018 Oct;122(8):1443–50.
20. Lichtenstein D, Goldstein I, Mourgeon E, Cluzel P, Grenier P, Rouby JJ. Comparative Diagnostic Performances of Auscultation, Chest Radiography, and Lung Ultrasonography in Acute Respiratory Distress Syndrome. Anesthesiology. 2004 Jan;100(1):9-15.
21. Al Deeb M, Barbic S, Featherstone R, Dankoff J, Barbic D. Point-of-care ultrasonography for the diagnosis of acute cardiogenic pulmonary edema in patients presenting with acute dyspnea: A systematic review and meta-analysis. Acad Emerg Med. 2014 Aug;21(8):843-52.
22. Moore CL, Copel JA. Point-of-care ultrasonography. N Engl J Med. 2011 Feb ;364(8):749-57.
23. Alber KF, Dachsel M, Gilmore A, Lawrenson P, Matsa R, Smallwood N, et al. Curriculum mapping for focused acute medicine ultrasound (FAMUS). Acute Med. 2018;17(3):168.
24. Watson K, Lam A, Arishenkoff S, Halman S, Gibson NE, Yu J, et al. Point of care ultrasound training for internal medicine: A Canadian multi-centre learner needs assessment study. BMC Med Educ. 2018 Sep;18(1):1–8.
25. Wisniewski J, Garnier H. Lifesaving Sonography Protocols: A Pilot Course Involving Undergraduate Medical Students. Int J Med Students. 2015 Mar;3(1):15–8.
26. Garnier H, Plosaj P, Wisniewski J. Ultrasonography as a Modern Teaching Support to the Anatomy Course: Is It Beneficial for Medical Students. Int J Med Students. 2015 Jun;3(2):119.
27. Yasukawa K, Minami T. Point-of-care lung ultrasound findings in patients with COVID-19 Pneumonia. Am J Trop Med Hyg. 2020 Jun;102(6):1198–202.

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Original Article

Scatterplot Variations Seen in Malaria Using Automated Hematological Analyzers: A Series of Ten Cases

Ronit Juthani,[1] Tavish Gupta,[2] Debdatta Basu.[3]

Abstract

Background: Malaria is a major health problem in India. Complete blood count and peripheral blood smear (PBS) are important for its diagnosis. Interobserver variation makes PBS fallible. Rapid diagnostic tests cannot detect low parasitemia and mixed infections. Scatterplot from automated analyzers have shown variations previously which might be exploited. **Methods:** This descriptive study was conducted between July and August 2018. Scatterplot patterns of ten samples of confirmed malaria and 100 control samples were derived using automated hematology analyzers All other infections were ruled out by relevant culture and serology. Each malarial scatterplot was compared with the control pattern for abnormalities and their frequency was noted. **Results:** All ten samples belonged to the *Plasmodium vivax* species. Abnormalities detected included split in neutrophilic region, eosinophil-neutrophil merge, neutrophil graying, lymphopenia, ghost red blood cells eosinophil split, reactive lymphocytes, monocytosis, pseudoeosinophilia and neutrophilic leukocytosis. **Conclusion:** Variations in scatterplot patterns are seen in malaria and provide clues to the diagnosis of malaria.

Key Words: Hematologic Tests; Diagnosis; Malaria (Source: MeSH-NLM).

Introduction

Malaria is a major health care problem in India. In the World Malaria Report 2020 produced by the World Health Organization (WHO), India currently accounts for 3% of the global malaria burden and contributes to 86% of total malaria cases in Southeast Asia.[1] *Plasmodium falciparum and Plasmodium vivax* are the dominant species responsible for the spread, with both being reported in almost equal proportions in India and varying based on regions.

The primary investigations ordered in suspected malaria include a complete blood count and peripheral blood smear (PBS) besides other serological and microbiological analyses. While these investigations are admirable and help in identifying a large case load, the true burden of the disease is estimated to be much higher than the above number. PBS examination remains a tedious process which is time consuming and subjective, based on the expertise of the examining person.[2] Low detection levels, especially at low parasite levels, limits the accuracy of a microscope. Expertise may bring about variations, with the most experienced microscope users detecting numbers as low as 5 parasites/µL while the average user detects 50 parasites/µL.

Asymptomatic cases with low parasite numbers may thus be underestimated.[3] As much as 25% of malaria cases may be missed by microscopy.[4] Rapid diagnostic tests (RDT), on the other hand, are a poor choice in cases having low density parasitemia and mixed infection with twin malaria species.[5] Performance may also be affected by temperature and humidity variations which damage the nitrocellulose membrane and bound monoclonal antibodies of RDT, thus affecting its performance.[6]

Modern hematologic analyzers work largely on two principles: optical scatter which measures the deviation in the pathway of light caused by the size and granularity of the cell and electrical impedance which measures the change in electric current caused by blood cells.[7] In a study previously conducted by us, we have shown how acute febrile illnesses caused by an infectious etiology have shown variations in scatterplot patterns obtained from automated hematologic analyzers.[8] In particular, numerous studies have been conducted showing cell abnormalities represented in peculiar ways in the scatterplots of malarial patients, with species identification also possible.[9-11] In this study, we report on ten cases of malaria, confirmed on peripheral blood smear examination which showed unique scatterplot patterns. We aim to highlight these new features of scatterplot patterns associated with malaria infection.

Methods

This descriptive study was completed in the hematology laboratory of Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India between July and August 2018. K2 EDTA blood samples of cases with PBS and microbiologically confirmed malaria were taken as study samples and samples with no history of fever and normal white cell counts and differentials were taken as control. Since the study was performed on blood samples taken as part of a routine investigation and patients remained anonymous, ethics approval was waived by the Institute Ethics Committee. A total of ten cases of malaria diagnosed during the time period along with 100 normal samples were studied in the automated Sysmex XT2000i hematology analyzer. A simultaneous culture and serology were done for the control samples to rule out any hidden infection which may cause variation in scatterplot pattern.

In each case, 2 mL of EDTA venous blood was collected and analyzed by automated analyzer. In each case the complete blood counts and the scatterplot patterns were studied. Comparison of each scatterplot generated from these cases was done with the prototype control pattern (***Figure 1***) and the abnormalities were noted. The PBS was

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stained by Leishman stain with 2 minutes fixation and 15 minutes staining and studied in details for the morphology of the blood cells and presence of the malarial parasites.

Results

A total of ten cases of malaria and 100 controls were collected and their scatterplots generated using the Sysmex XT2000i analyzer. Out of the ten cases, five were taken from one of our earlier studies on scatterplot and acute febrile illnesses conducted around the same time.[8] The representative control normal scatterplot pattern used is shown in ***Figure 1***.

All cases of malaria were of the *Plasmodium vivax* species and were confirmed by both positive RDT and the presence of trophozoites in the peripheral blood smear. The following findings were noted:

1. A split in the neutrophil region was evident in 5 of the 10 samples. This was represented by a change in shape of the light blue color from the normal ellipse to a double ellipse joined at the ends.
2. A merging of the eosinophilic region with the neutrophilic region was noted in 4 of the 10 samples. This was represented by the blue and the red population merging together without any space between them.
3. Graying of the neutrophil area was seen in 2 out of the 10 samples. While we are considering this as a separate entity, it may be considered a variant of the neutrophil-eosinophil merge with the only difference being an inability to recognize neutrophils and eosinophils as separate entities.
4. Lymphopenia was noted in 4 of the 10 samples. This was indicated by:
   - -Decrease in the area occupied by the pink color
   - -Decrease in the intensity of the pink color
5. Increased ghost red blood cells (RBC) were noted in 4 of the 10 samples. This was experienced by an increase in the area or intensity of dark blue color which was greater than two divisions on the x-axis.
6. A split in the eosinophil population was noted in 3 of the 10 samples. This presented in the scatterplot as two populations of red color separated by a band of black color either in the x-axis or y-axis.
7. Reactive lymphocyte populations were seen in 2 samples by a shower of pink cells which were present over the green monocytic region.
8. Besides pseudoeosinophilia, both monocytosis and neutrophilic leukocytosis were each seen in 2 of the 10 samples.

A composite image highlighting all the findings has been shown in ***Figure 2***.

Discussion

According to a WHO report in 2019, there were an estimated 409 000 deaths from malaria globally.[1] Hence, the diagnosis of malaria should be prompt and accurate so that treatment can be started in a timely manner to avoid unnecessary complications. PBS examination is often the first line of investigation in suspected cases of malaria and changes in the scatterplot pattern, if carefully identified, it can help in identifying the parasites earlier in the blood.

The key abnormalities found in our scatterplot analysis included neutrophil splitting, eosinophil-neutrophil merge, graying of neutrophil region, lymphopenia, ghost RBC increase and eosinophil split. Automated hematological analyzers are based on flow cytometry. Special fluorescent dyes are used to stain nucleic acids. The channel lyses RBCs along with platelets and binds the nucleic acid using a dye to give a fluorescence proportionate to the nucleic acid content. The higher the percentage of nucleic acids, the greater the intensity of scatterplot pattern.[12]

Figure 1. Representative scatterplot showing the pattern of white blood cells in a peripheral blood smear. The pink plot represents lymphocytes, green represents monocytes, light blue represents neutrophils, red represents eosinophils, and red represents red blood cells.

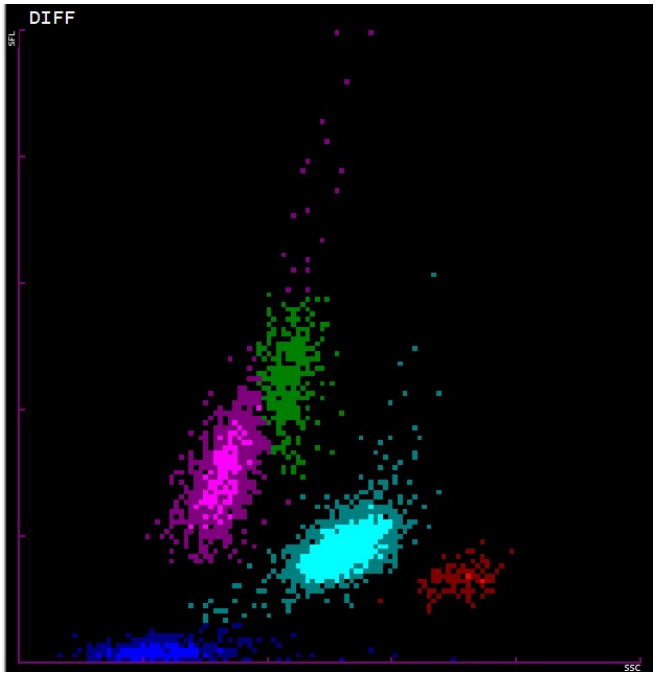
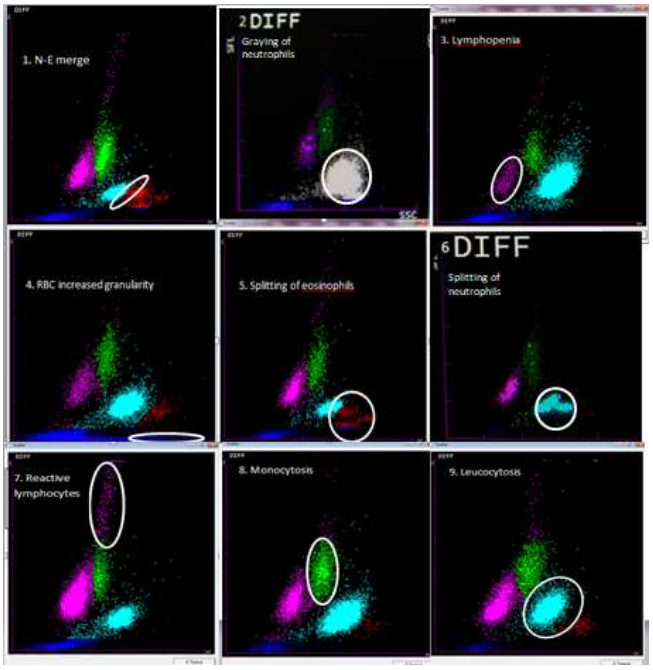


Figure 2. Scatterplot variations and their interpretations:1. Neutrophil and eosinophil merge, 2. Graying of neutrophils, 3. Lymphopenia, 4. Increase in RBC granularity, 5. Splitting of eosinophils, 6. Splitting of neutrophils, 7. Reactive lymphocytosis, 8. Monocytosis, 9. Leucocytosis.



In all ten cases with scatterplot abnormalities, schizonts of *Plasmodium vivax* was seen in the peripheral smears, which was expected considering the low incidence of *Plasmodium falciparum* in Pondicherry.[13] Specific changes have been observed in *Plasmodium vivax* because of the presence of hemozoin pigments of the schizonts in the peripheral blood. These changes have been more often seen in

Plasmodium vivax than in *Plasmodium falciparum*, as schizonts are usually not seen in the peripheral blood in the latter.[14,15] This may be a limitation of this detection method, as *Plasmodium falciparum* infections are missed by scatterplot investigations.

Earlier studies have found changes such as pseudoeosinophila and the graying of neutrophilic areas as relevant findings, which make it pertinent to check for malarial parasites in peripheral blood smear.[16,17] We were evidently able to concur such findings in our study. Apart from that, we were able to obtain unique findings of increased ghost RBC density, lymphopenia, and a dual population of eosinophils represented by a split in the eosinophilic region, which we found to be a good pointer of malaria. In 50% of our cases, neutrophil population split was found. This could be a potentially strong indicator of malaria. Neutrophilic merge with the eosinophilic region was also a unique finding, as was eosinophil split. Reactive lymphocytosis and monocytosis are findings in a number of other illnesses but should also arouse a strong suspicion of malaria if it can be correlated clinically and epidemiologically as malaria.

A study conducted by Huh et al in South Korea extensively studied 144 cases of Plasmodium vivax malaria and found a high incidence of pseudoeosinophilia characterized by a difference in the eosinophil count detected by the analyzer and observed on the smear.[18] This was found to be as high as 39%. In our study, we only detected two samples with pseudoeosinophilia, showing that pseudoeosinophilia may not be a very sensitive finding. This is in line with other Indian studies which have found spurious eosinophilia in 1.5-4% of the population.[9,19] The same study by Huh et al also found similar findings of dual eosinophil and neutrophil population; however, their incidence was very low compared with the pseudoeosinophil population. In total, they found 52.10% scattergrams being abnormal, indicating their importance in diagnosis.[18] A follow up study conducted by Yoo et al in 2010 found abnormalities in 15.70% of the scattergrams, despite finding the same incidence of pseudoeosinophilia.[20] In fact, these authors hypothesized that pseudoeosinophilia, neutrophil clusters and neutrophil-eosinophil merge were largely resulting from the hemozoin pigments in neutrophils and shouldn't be considered a separate entity. While studies by Huh et al. and Yoo et al. have found 52.10% and 15% of abnormal, in our study we found all ten of our samples to report some kind of abnormal scatterplot, which was in line with the Indian studies mentioned earlier that found 100% and 83.8% abnormal scatterplot patterns.[9,19] Thus, being aware of these scatterplot findings in the presence of clinical suspicion may help in the early diagnosis and initiation of treatment in malaria. A limitation of our study is the small sample size, yet it constitutes a sizeable number compared to the annual incidence of malaria in Puducherry.

Conclusion

Scatterplot patterns in malaria have been reported with varying sensitivity and specificity. We found abnormal scatterplot patterns in all the 10 cases of *Plasmodium vivax* malaria some of which have not been described before. These patterns should be kept in mind by the pathologist or the laboratory personnel and should prompt a thorough screening of the peripheral blood film to confirm for the parasites. When supplemented with peripheral blood smear examination, they are an adjunct to the current diagnostic modalities.

References

1. 1. World Malaria Report 2020, Geneva : World Health Organization 2020. Available from: https://apps.who.int/iris/rest/bitstreams/1321872/retrieve
2. Nema S, Verma AK, Bharti PK. Strengthening diagnosis is key to eliminating malaria in India. 2019 Dec;19(12):1277-8.
3. Ohrt C, Purnomo, Sutamihardia MA, Tang D, Kain KC. Impact of microscopy error on estimates of protective efficacy in malaria prevention trials. J Infect Dis. 2002 Aug 15;186(4):540-6.
4. Okell LC, Ghani AC, Lyons E, Drakeley CJ. Submicroscopic infection in Plasmodium falciparum-endemic populations: a systematic review and meta-analysis. J Infect Dis. 2009 Nov 15; 200(10):1509-17.
5. Krishna S, Bharti PK, Chandel HS, Ahmad A, Kumar R, Singh PP, et al. Detection of Mixed Infections with Plasmodium spp. by PCR, India, 2014. Emerg Infect Dis. 2015 Oct;21(10):1853-7.
6. Chiodini PL, Bowers K, Jorgensen P, Barnwell JW, Grady KK, Luchavez J, et al. The heat stability of plasmodium lactate dehydrogenase- based and histidine-rich protein 2-based malaria rapid diagnostic tests. Trans R Soc Trop Med Hyg 2007 Apr;101(4):331-37.
7. Green R, Wachsmann-Hogiu S. Development, history, and future of automated cell counters. Clin Lab Med. 2015 Mar;35(1):1-10.
8. Juthani R, Basu D. Use of scatterplot patterns derived from automated haematological analysers in the diagnosis of acute febrile illnesses. J Clin Diagn Res. 2020 Feb;14(2): EC06-EC10
9. Singh A, Narang V, Sood N, Garg B, Gupta VK. Malaria diagnosis using automated analysers: A boon for hematopathologists in endemic areas. J Clin Diagn Res. 2015 Oct;9(10):EC05-8.
10. Jain M, Gupta S, Jain J, Grover RK. Usefulness of automated cell counter in detection of malaria in a cancer set up-Our experience. Indian J Pathol Microbiol. Oct-Dec 2012;55(4):467-73.
11. Sharma S, Sethi N, Pujani M, Kushwaha S, Sehgal S. Abnormal WBC scattergram: a clue to the diagnosis of malaria. Hematology. 2013 Mar;18(2):101-5.
12. Hill VL, Simpson VZ, Higgins JM, Hu Z, Stevens RA, Metcalf JA, et al. Evaluation of the performance of the sysmex XT-2000i hematology analyzer with whole bloods stored at room temperature. Lab Med. 2009 Dec;40(12):709-18.
13. Dhiman S, Veer V, Dev V. Declining transmission of malaria in India: Accelerating towards elimination. In: Towards Malaria Elimination - A Leap Forward. InTech; 2018.
14. Campuzano-Zuluaga G, Hänscheid T, Grobusch MP. Automated haematology analysis to diagnose Malaria. Malar J. 2010 Nov 30;9:346.
15. Mubeen KH, Devadoss CW, Rangan RA, Gitanjali M, Prasanna S, Sunitha VP. Automated Hematology Analyzers in Diagnosis of Plasmodium vivax Malaria: an Adjunct to Conventional Microscopy. Mediterr J Hematol Infect Dis. 2014 Jun 1; 6(1):e2014034.
16. Buoro S, Manenti B, Seghezzi M, Moioli V, Bagorria M, Callegaro A, et al. Abnormal scattergrams and cell population data generated by fully automated hematological analyzers: New tools for screening malaria infection? Int J Lab Hematol. 2018 Jun;40(3):326-34.
17. Mohapatra S, Samantaray JC, Arulselvi S, Panda J, Munot K, Saxena R. Automated detection of malaria with haematology analyzer Sysmex XE-2100. Indian J Med Sci. 2011 Jan;65(1):26-31.
18. Huh J, Oh GY, Huh JW, Chae SL. Malaria detection with the Sysmex XE-2100 hematology analyzer using pseudoeosinophilia and abnormal WBC scattergram. Ann Hematol. 2008 Sep;87(9):755-9.
19. Sharma S, Sethi N, Pujani M, Kushwaha S, Sehgal S. Abnormal WBC scattergram: a clue to the diagnosis of malaria. Hematology. 2013 Mar;18(2):101-5.
20. Yoo J-H, Song J, Lee K-A, Sun Y-K, Kim Y-A, Park TS, et al. Automated detection of malaria-associated pseudoeosinophilia and abnormal WBC scattergram by the Sysmex XE-2100 hematology analyzer: a clinical study with 1,801 patients and real-time quantitative PCR analysis in vivax malaria-endemic area. Am J Trop Med Hyg. 2010 Mar;82(3):412-4.

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Original Article

Folk Medicine in the Philippines: A Phenomenological Study of Health-Seeking Individuals

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Abstract

Background: Folk medicine refers to traditional healing practices anchored in cultural beliefs of body physiology and health preservation. Reflective of indigenous heritage, it fosters a better understanding of health and disease, healthcare systems, and biocultural adaptation. In the Philippines, Quiapo is a well-known site for folk medicine services, cultural diversity, religious practices, and economic activities. **Methods:** This study utilized a phenomenological approach to comprehend the lived experiences of health-seeking individuals and the meaning behind their acquisition of folk medicine products. Using convenience sampling, seven participants acquiring folk medicine products in Quiapo on the day of data collection were approached and interviewed on separate instances. The collected data subsequently underwent thematic analysis. **Results:** Analysis revealed three emergent themes: health-seeking behavior, sources of knowledge, and folk medicine utilization. Health-seeking behavior was linked with the participants' purpose of going to Quiapo, reasons for utilizing folk medicine, experiences in using folk medicine, and beliefs associated with the product bought. Sources of knowledge tackled the participants' sources of information about Quiapo and its products. Folk medicine utilization relates to the type of product bought, its perceived medicinal use, and its history of usage. **Conclusion:** Folk medicine is perceived to be effective in alleviating health concerns. The acquisition of such products is attributed to satisfaction from prior experience, distrust in the current healthcare system, family tradition, and intention to supplement existing medical treatment. This study provides health professionals a better understanding of patients who patronize folk medicine, subsequently aiding them in providing a holistic approach to treatment.

Key Words: Traditional medicine; Medical anthropology; Folk medicine; Indigenous medicine; Health care seeking behavior; Philippines (Source: MeSH-NLM).

Introduction

Medical anthropology is hardly tackled in the field of medicine as it deviates from conventional standards. It is a branch of social sciences that draws upon social, cultural, and biological anthropology to better understand factors influencing human health. This includes the science behind the experience and explanation of illness and disease, the prevention and treatment of sickness, and the healing processes. Likewise, it also involves other factors such as the social relations of therapy management, the biocultural and political study of health ecology and its adaptations, the cultural importance and utilization of pluralistic healthcare systems in culturally diverse environments, and even magic and sorcery.[1-3]

Folk medicine is a field that falls under medical anthropology. It refers to traditional health knowledge and healing practices anchored on indigenous beliefs regarding body physiology and health preservation.[4] It incorporates herbals or plant-based medicines, animal derivatives, natural minerals, spiritual therapies, manual techniques, and physical exercises, which are either applied singularly or in combination, with the intention to either maintain wellbeing or to diagnose, treat, and prevent illness.[5] It exists today as a diverse blend of traditional medicine that has been widely practiced in China, India, and Greek Persia since time immemorial, along with western medicine, while retaining its unique socio-cultural characteristics.[6] These practices foster a people-centered, cross-cultural, transdisciplinary, and critically reflective approach to both the structural and social models of health.[7]

In the Philippines, folk medicine is an organized body of traditional practices and beliefs that mirrors the country's indigenous culture and heritage. It basks in locally accepted concepts of disease causation, utilizes distinct techniques and human instinct as the means to reach a diagnosis, and applies unique methods of treatment, distinct from the conventional practices of western medicine.[8,9]

Quiapo, located at the heart of the City of Manila, is well-known as a center for religious and economic activities nationwide. It serves as a heritage site for cultural diversity and is a thriving area for businesses as its commercial centers continuously expand annually. It is home to the largest market in the Philippines, known as the Quiapo Market, which is situated right beside the famous and frequented Quiapo Church.[10,11] Given the diversity of cultures eminent in the Philippines, a wide array of herbal concoctions is openly displayed on kiosks that span the whole area of the market. Despite being famed for its abortive herbal concoctions and love potions, herbal remedies are also readily available for healing physical ailments, such as coughs, colds, headaches, or fevers.[11-13] In addition, Filipinos can also find perhaps the most exotic products and services one could ever be interested in, such as magic candles, pickled snakes, jarred scorpions, amulets, palm and tarot readers, and occult services.[11,12] With that said, diversity deems to be an appropriate theme to associate with Quiapo. Moreover, it is a religious site for people of different religions but has gained notoriety as it also serves as a hub for criminal activities. It is seen as a thriving marketplace by vendors, yet it also represents various main

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symbols of urban poverty.[11] Simply put, Quiapo is a place for a wide array of things and this diversity is probably what enables Filipinos, regardless of existing divisions in our country in terms of identity, social class, religion, culture, education, and politics, to identify with Quiapo, to truly find a place where any type of individual can belong.

Folk Medicine History and Culture

Folk medicine refers to the treatment of illness through traditional medicine — rather than Western or modern medicine — wherein herbs and other natural substances are the primary means for medication.[14,15] The credibility of folk medicine revolves around the fact that it was established even before the era of modern medicine – dating back to ancient Sumerians 5,000 years ago, rooted in the primary knowledge of our great ancestors regarding the use of plants as medicine.[16] For the longest time, this unconventional approach towards healthcare has been one of the most controversial medical issues that unfortunately still remains barely explored to date, especially in the advent of technological advancements. Thus, it is believed for this very reason, that widespread misconceptions, and thereby lack of understanding, rampantly exist. The fact that the reason for its enduring popularity among its patrons still goes beyond our current knowledge already serves as a strong argument as to why this field ardently needs attention and further studies. These concerns have ignited the genuine desire to bridge the gap, not only for the benefit of its consumers and producers, but for the curious minds as well.

Its global establishment, especially in terms of culture and religion, led to garnering of trust and acceptance among its patrons, enduring the times as it is carried over to our generation today. In any particular place, the strong culture and persistent beliefs influence the usage of herbal medicines and reflect a prevailing culture or economic condition where a healthcare system is absent or lacking.[17] The patronage of herbal therapies continues to grow rapidly across the world with an estimation of four billion people in developing countries now resorting to these products as the primary health interventions to various diseases and illnesses. Most of these communities view the use of herbal medicine as a vital part of their culture.[18]

Determinants of Health-Seeking Behavior

In both rural and urban areas in the Philippines, folk medicine and western medicine systems are being utilized simultaneously. It has been a curiosity for many how patrons of folk medicine continue to avail of such. However, they fail to consider that deciding between these two approaches depends on various, but equally valuable, factors that lead to a person's health-seeking behavior. Determinants such as culture, inherited health approaches, familial background, geographical location, level of education, caste or socioeconomic status, environment, lifestyle, healthcare systems in the community, and perspective towards healthcare practitioners can play important roles in their health-seeking behavior.[9,15,17] It was also found that an individual's religion and profound sense of spiritual consciousness predisposes them into viewing therapeutic value based on faith or intuition rather than scientific reasoning.[18]

Having a low economic status has also led to inadequate health awareness and lesser-quality healthcare.[9,15] Due to financial constraints, poor and low-income Filipinos frequently turn to folk medicine services and products because of its affordability. Modern medical practitioners charge expensive fees for their services, while in contrast, albularyos or folk healers open-heartedly accept anything their patients can give them as a form of gratitude or payment.[12,15,19] This is the current situation of the Philippine healthcare system due to the fact that the country has a mixed health system of both private and public sectors, the advent of exponentially growing private sectors, and the lack of an effective means to properly standardize private for-profit physicians.[20] Despite the government's efforts in implementing substantial health sector reforms, healthcare in the Philippines remains to be inaccessible and inequitable for many Filipinos, especially for the poor.[21] Moreover, out-of-pocket medical expenditures, including medicines and hospitalization, continue to be an economic burden.[22,23] More than 50% of the total health-related expense of the country fall under out-of-pocket expenses, which may potentially worsen the poverty status of many Filipinos.[20,21]

Other determinants include personal relationships and past performance. An albularyo or faith healer's popularity among patients greatly depends on their skills as healers and their relationship approach towards their patients. Moreover, patients tend to seek treatment from the same healer who provided them with a prior successful treatment or pleasant relationship.[19] This is because most folk healers ask their patients to visit them regularly to follow up on the status of their disease, allowing them to better understand the progress of treatment while maintaining constant communication with their patients.[24]

Folk Medicine in the Philippines

In the Philippines, folk medicine practices such as *orasyon* or *bulong* (mystical prayers), *himulso* (pulse checking), *pagtatawas* (diagnostic ritual using candle wax dropped in a basin of water), *pasubay* (determining the cause of sickness and possible treatment), *pangalap* (searching of medicinal plants), *tayhop* (gentle blowing), *tutho* (saliva blowing), *hilot* (traditional massage), *tapal* (applying folk medicine on the affected area), *pangontra* or *kontra-usog* (carrying an amulet to prevent diseases), *anting-anting* or *pampaswerte* (lucky charm), and *barang* (sorcery), remain to be rampant.[9,15,25-27] Studies show that the most evident factor that comes into play is religion, which is heavily influenced by the strong religious beliefs of Filipinos.[9,25] Prior to the colonization of Spain, Filipinos had already established their religious beliefs and practices.[28] Despite disapproval by medical practitioners, some individuals nowadays still seek help from folk medicine healers prior to consulting conventional physicians when it comes to treating their ailments. Some of them believe that diseases were traditionally theorized to come from either natural or supernatural origins. Natural forces that are deemed to influence the well-being of Filipinos include stress due to overworking, sleep deprivation, emotional stresses, unsanitary living or work environment, overeating, insufficient nutrition or malnutrition, overexposure to natural elements, and imbalance of hot and cold elements.[19] Meanwhile, Filipinos believe that diseases brought about by supernatural causes are due to the displeasure or irritancy of spirits found in our natural environment, demonized souls, evils, witches, sorcerers, or punishment from supernatural beings such as deities and gods.[9,19,29]

Moreover, the persistent presence of *albularyos* (faith healers) and folk medicine establishments in the country is an indication of the continued patronage and reliance of Filipinos on folk medicine. The *albularyos* themselves serve as primary informants due to their popularity in healing.[9,15,25] An example of the said scenario can be observed in Quiapo, Manila, wherein one can freely acquire folk medicine services and different types of medicinal plants to combat illnesses.[12,30]

Methods

Research Goal and Design

This study utilized a qualitative research methodology in understanding the lived experiences of health-seeking individuals in acquiring folk medicine in Quiapo, Manila and describing the meaning behind their acquisition of these services. Specifically, it used a phenomenological research design since its primary aim was to encapsulate the full meaning of the lived experiences of the participants.

Participants and Sampling

Only one criterion was applied in selecting the participants to ensure that the data collected was as diverse as possible. The participants should be health-seeking individuals who are availing folk medicine services in Quiapo, situated in Manila. Using a convenience sampling

technique, the authors were able to interview seven participants, based on the premise that they have given their full consent to be the respondents of the study through informed consent forms, which were thoroughly explained to them. After they signed said form, participants answered the interview questions and shared their experiences to the best of their knowledge. The participation of every subject in the research entailed no risk or harm. Likewise, no monetary payment was given to the participants for their participation in the study. With utmost respect towards confidentiality, all gathered information was kept confidential. To protect the identities and privacy of the participants, their statements were written in the transcriptions under aliases, which they chose for themselves, rather than by their real names.

Instrument

The authors developed questions based on related studies on folk medicine,[11-19,25-27] that aided them to probe deeper and to witness the experiences of the participants first-hand as if they were their own. The questions were carefully formulated to ensure that they were free from any form of prejudice, bias, or influences that may otherwise ruin the essence of such an approach, which is to interpret the phenomena regarding the experiences and meanings that individuals bring to them. In addition, the authors made sure that the questions included in the interview guide would not in any way violate the participants' rights as human beings, nor will it be used to discriminate against health-seeking individuals under any circumstance. The interview guide was also carefully reviewed and approved by the Department of Family and Community Medicine of Centro Escolar University School of Medicine. It was written and executed in the Filipino language to reduce the communication gap between the authors and the participants.

Ethics Approval

A proposal of the study was presented to the Ethics Review Committee of the Centro Escolar University School of Medicine for approval. After a thorough ethical review of the proposal, the study was granted approval on April 10, 2018, valid until June 30, 2018.

Data Collection

On the day of data collection, the authors headed to the folk medicine area of Quiapo and stationed themselves for an entire day while observing ongoing trades between sellers and consumers and taking down personal reflections. Health-seeking individuals were then physically approached on separate instances while they were acquiring folk medicine products. Once entertained by a prospective participant, the purpose and procedure of the interview were then discussed. The authors also made it known that the interview will be conducted at a glass-enclosed section of a nearby fast-food restaurant, which was three minutes away by foot to facilitate a noise-free and conducive environment for the interview. The willing participant then proceeded to the restaurant to be interviewed by the authors, bringing along the folk medicine product they had just bought. Upon arrival at the restaurant, the authors again thoroughly explained the purpose and procedure of the interview, entertaining questions and clarifications from the participant. The participant was then asked to read, sign under their own volition, and keep a copy of their informed consent form. Subsequently, the interview proper commenced and lasted for at least 30 minutes and a maximum of 1 hour. The interview proper was documented through writings, as well as through voice recorders for accurate data transcription purposes. Confidentiality of the participant's identities has been maintained. After the data gathering, transcription of the interview recordings was carried out by the same interviewers of each participant and were subsequently validated by other authors of this study.

Data Analysis

This qualitative study utilized thematic analysis to interpret its findings. It focused on the important questions, topics, time periods, and events of the experiences of each individual. Through the process of horizontalization, all statements that were relevant to the participant's experience were listed, and each comment was considered to hold equal value. The findings were then interpreted and categorized accordingly into codes, which were all held verbatim. This was done by going through all interview transcriptions and labeling words, phrases, and sections of text that were related to the research questions of interest. Then, the codes were grouped into themes that aided the authors in answering each research question. Finally, the themes were organized into coherent categories that summarized and brought meaning to the text, enabling the authors to formulate the essences of the experiences of the participants, both individually and as a whole. All of these were manually done, without the use of any qualitative software tool.

Results

Sociodemographic Profile of Participants

Out of seven participants, the majority were female (71.43%), below 50 years old (57.14%), married (57.14%), unable to study or finish college education (85.71%), originated from the province (85.71%), unemployed (71.43%), and Catholic (85.71%) (***Table 1***).

Table 1. Sociodemographic Profile of Participants.

Participant	Age	Sex	Civil Status	Education	Religion
A	26	Male	Single	College Undergraduate	Catholic
B	54	Female	Widow	High School Graduate	Islam
C	47	Female	Married	High School Graduate	Catholic
D	61	Female	Married	College Undergraduate	Catholic
E	65	Female	Widow	High School Graduate	Catholic
F	39	Female	Married	College Undergraduate	Catholic
G	43	Male	Married	College Graduate	Catholic

Experience of Participant A

Participant A, a 26-year-old male from the province of Iloilo who currently lives in Quezon City, has been availing folk medicine products for six years. His purpose of going to Quiapo was to buy *kakawate* leaves and coconut oil for his rashes. He boils the *kakawate* leaves, which he uses for bathing, and applies the coconut oil over the affected skin. This practice began six years ago back in his province and mentioned that it goes way back to his ancestors. The rashes recurred whenever he was back in Manila. Unfortunately, the *kakawate* leaves were not common in Manila. He then recalled that he saw herbal products being sold outside Quiapo church whenever he attended church service, and so he went there to check. He stated that he had prior experience with these folk medicine products which cured the rashes. However, when asked regarding how he approaches his health when faced with other diseases, he said that it depends on the illness, adding that he will take medicine if it is already serious. Upon further probing, he stated that he would take medicine for a fever or flu, but when it comes to rashes, an oil or concoction is fine since it only involves the skin. He also revealed that he tried to remedy his rashes with Cetirizine and Loratadine. Unfortunately, it didn't seem to work, which is why he resorted to *kakawate* leaves, knowing it worked in the past.

Experience of Participant B

Participant B, a 54-year-old female from the province of Lanao del Sur who currently lives in Quezon City, bought *pito-pito* concoction in Quiapo for her diabetes even though she was taking maintenance medications. She revealed that her siblings who also had diabetes passed away because they refrained from seeking medical attention due to distrust of the efficacy of western medicine. She wanted to try taking herbal medicine on top of her maintenance medicine as she thought that it was effective. This was her first time using *pito-pito*, which was recommended to her by a friend. She stated that it is not harmful since it is "herbal." When asked about some of her experiences in herbal medicine, she stated that she stands by it as she has had prior positive experiences. However, she also believes that it might not be the case for everyone else.

Experience of Participant C

Participant C, a 47-year-old female from Manila who went to Quiapo for the first time to buy *sambong* leaves for her hospitalized husband who

is suffering from kidney disease. It was revealed that she overheard another patient in the hospital that *sambong* is an effective herbal medicine for kidney diseases that can be found in Quiapo. She appears to be hopeful that the *sambong* would be able to cure her husband's ailment. Her husband's first encounter with *sambong* was from his boss' mother when he accompanied him to the Bicol province. He was told that *sambong* is useful in treating kidney stones. Her husband bought a pile of *sambong* back home and continued using it until he no longer felt pain. In case the sickness worsens, she would bring him to the community clinic and in the worst cases, to the hospital. She resorted to herbal medicine because she thinks that hospital care alone does not suffice in bringing her husband back to full health. She even added that the doctors were not able to detect her husband's kidney disease despite having the alleged symptoms. Most of her statements from the interview suggested that she, along with her family, considers herbal medicine as effective maintenance for her husband's kidney problems.

Experience of Participant D

Participant D, a 61-year-old female from the province of Marinduque who currently lives in Quezon City, bought guava leaves in Quiapo as a supplementary medicine for her daughter's surgical wound who was recently discharged from the hospital. She shared that she only goes to Quiapo to buy herbal medicine, attend church service, or buy fruits and vegetables. She is planning to supplement the treatment of her daughter by using guava leaves since her daughter's antibiotic treatment is already finished. She stated that she prepares the leaves by boiling and applies the prepared extract topically on the surgical wound. She believes in its efficacy as the use of guava leaves extract over the wound has been practiced in their province for ages and is known to work. She happened to learn the availability of the herbal products on television and from her relatives that also used herbal medicines from Quiapo. She shared that whenever someone is going to give birth for the first time, it has been their practice to boil the leaves for bathing since they believe it will prevent complications and relapse after giving birth. When asked about her personal experience regarding the usage of herbal medicine, she said that the wound healed, explicitly expressing her trust in its effectiveness. In addition, it has been their primary source of medicine when there were no doctors in their province before. Despite already having doctors in their community, she still uses traditional medicine at present. She also said that they use herbal medicine as an adjunct to conventional medicine.

Experience of Participant E

Participant E, a 65-year-old female from the province of Pangasinan who currently lives in Manila. She went to Quiapo to buy guava leaves for her rashes and snakeroot for her diabetes. She added that she no longer trusts hospitals and doctors and explicitly stated that she lost both her husband and son because of medical negligence, expressing it with great disapproval and dismay. In addition, she firmly stated that most patients are neglected in government hospitals, which eventually leads to their deaths regardless of if they could afford its services or not. She has been using folk medicine for years now and owes most of her knowledge regarding folk medicine from a local television show called "*Healing Galing*," as well as from YouTube. On the other hand, she explained that although she still visits the hospital for check-ups, she no longer relies on the medications prescribed to her. Instead, she resorts to buying its herbal counterparts at Quiapo. Instead of Metformin, she uses snakeroot for her diabetes. On top of its superior efficacy over Metformin, she claimed that snakeroot did not give adverse effects such as vomiting episodes, which she experienced with the prior drug. She firmly believes that these remedies are far more effective than conventional medicine. Furthermore, she believes that her long-time practice of folk medicine shows that her experience with it has been positive overall, and it has led to a significantly reduced need for visits to the clinic or hospital.

Experience of Participant F

Participant F, a 39-year-old female from the province of Leyte who currently lives in Caloocan City, went to Quiapo to buy *culapol*, a traditional medicine, which she uses for dysmenorrhea, and an ointment for arthritis. She is a long-time user of *culapol* and would often take it with soft drinks. She added that it could be taken without prior food intake. She claimed that this originated from Leyte, which can now be found in Quiapo. She verbalized that it was effective for her, especially the *culapol*. It was revealed that she is the sole member in her family that relies on traditional medicine as she is not inclined to take western medicine. However, she seemed to rely on over-the-counter drugs when it comes to treating her children's ailments. After the interview, she showed the bottle of *culapol*. It was labelled "*pamparegla*," which is commonly used for stimulating menstrual bleeding. According to the vendors, *culapol* is an abortifacient.

Experience of Participant G

Participant G, a 43-year-old male from the province of Cebu who currently lives in Manila, is a long-term user of folk medicine. He went to Quiapo to buy an ointment for rashes, and white flower oil, which he uses for dizziness. He stated that he would buy these in bulk prior to boarding the ship, and even recommended them to his fellow seafarers, which he started using back in his high school years. Despite his inclination towards folk medicine, he stated that whenever he gets a medical condition that is not related to skin rashes or dizziness, he would seek proper medical attention and followed the medication prescribed by doctors. With this statement of his, it is safe to say that his health-seeking behavior involves western and folk medicine. When asked about the effectiveness of the ointment and white flower oil, the participant quickly responded that they are very effective. Moreover, he also shared that he uses the same ointment for his children whenever they would experience itchiness, especially due to diaper rash. This signifies that the use of herbal medicine is also being practiced in their family.

The table below contains a summary of the products bought by the participants, including their scientific names and their medicinal uses perceived by the participants (***Table 2***).

Table 2. Folk Medicine Products Bought by the Participants.

ID	Common Name of Product Bought	Product's Scientific Name	Perceived Medicinal Use
A	Kakawate leaves Coconut oil	*Gliricidia sepium* *Cocos nucifera*	Rashes
B	Pito-pito herbal concoction*	*Premna odorata blanco* *Pimpinella anisum* *Lagestroemia speciose* *Psidium guajava* *Mangifera indica* *Pandanus amaryllifolius* *Coriandum sativum*	Diabetes
C	Sambong leaves	*Blumea balsamifera*	Kidney disease, Kidney stones
D	Guava leaves	*Psidium guajava*	Wounds
E	Guava leaves Snakeroot	*Psidium guajava* *Rauvolfia serpentina*	Rashes Diabetes
F	Culapol wine Herbal ointment	- -	Dysmenorrhea Arthritis
G	Herbal ointment White flower oil**	- *Mentha* *Eucalyptus globulus* *Gaultheria procumbens* *Cinnamomum camphora* *Lavandula angustifolia* *Mentha piperita*	Rashes Dizziness

**Pito-pito*, a herbal concoction, is a blend of 6 kinds of leaves and 1 type of seed, namely, the leaves of alagao, anise, banaba, guava, mango, and pandan, and seeds of coriander. **White flower oil refers to a Chinese oil-blend mixture of menthol, eucalyptus, wintergreen, camphor, lavender, and peppermint.

Conceptual Analysis

The authors have developed basic themes from the codes and organized them into primary and secondary organizing themes that eventually led to the global theme. The coding statements gave way to twenty-six basic themes that were grouped into eight secondary organizing themes and further arranged into three primary organizing themes, paving the way to the central idea of the study which is the experiences of health-seeking individuals acquiring folk medicine services from Quiapo (***Figure 1***, ***Table 3***).

The first primary organizing theme, "health-seeking behavior," has four secondary organizing themes, namely 1) beliefs associated with the product bought, 2) experiences in using folk medicine, 3) purpose of going to Quiapo, and 4) reasons for utilizing folk medicine. For the first secondary organizing theme, different ideas arose from the participants' answers regarding their views on the product that they bought: 1) "many are saying that it is good," 2) "similar practice in the province," and 3) "effective for me." One basic theme was developed under the second secondary organizing theme regarding the participants' experiences in using folk medicine. All the participants' answers were organized with the basic theme, "it cured me." The authors came up with a single basic theme under the third secondary organizing theme regarding the participants' purpose of going to Quiapo, which is "bought medicine." Many basic themes emerged under the fourth secondary organizing theme that discusses the participants' reasons for utilizing folk medicine, namely 1) "supplemental medicine," 2) "does not trust doctors," 3) "I really use it," 4) "in the province," and 5) "because it is herbal."

The second primary organizing theme, "folk medicine utilization," has three secondary organizing themes, namely 1) medicinal use of product, 2) product bought, and 3) history of usage. Under its first secondary organizing theme, five basic themes emerged which include 1) "medicine for diabetes," 2) "for itchiness," 3) "topical for wound care," 4) "for the kidney," and 5) "stomach ache." For the second secondary organizing theme regarding the products that were bought by the participants, three basic themes were developed, namely 1) "medicine for itchiness," 2) "*culapol* wine," and 3) "herbal medicine." Meanwhile, four basic themes emerged from the third secondary organizing theme regarding the participants' history of usage, which are 1) "1994," 2) "taken last December 2017," 3) "six years," and 4) "will only try now."

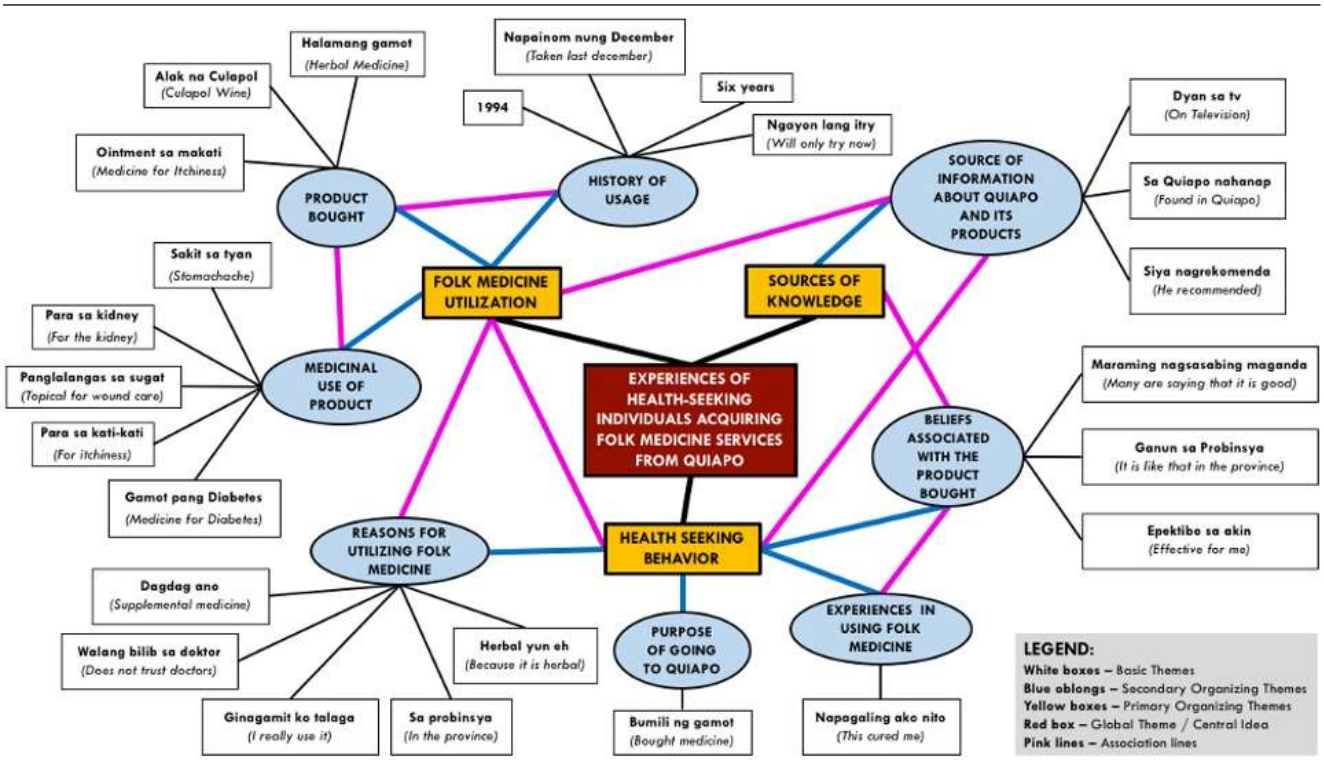
The third primary organizing theme, "sources of knowledge", has a single secondary organizing theme that tackled the source of information about Quiapo and its products. Such, in turn, paved the way for 3 basic themes, namely 1) "on television," 2) "found in Quiapo," and 3) "someone recommended it."

The pink lines in the illustration (***Figure 1***) signifies the association of the different themes with each other. The pink lines connecting the history of usage and the medicinal use of the product to the product bought explains that the product bought will eventually be related once the participant already has a history of usage and prior knowledge or experience on its medicinal use. On the other hand, the source of information about Quiapo and its products can be correlated with folk medicine utilization because having the knowledge where to acquire these products may subsequently lead to the acquisition of goods and knowledge on how to utilize the products bought. The source of information about Quiapo and its products can also give way to different health-seeking behaviors because having such knowledge will give the participants a purpose or reason to go to Quiapo. Folk medicine utilization can also be linked to health-seeking behavior, as any individual with a health-seeking behavior may possibly utilize folk medicine, especially if he is equipped with knowledge on such. Furthermore, sources of knowledge can be a factor when it comes to the participants' beliefs associated with the products that they choose to buy, for example, if the participant's beliefs are deeply-rooted in the

Table 3. Primary and Secondary Organizing Themes of the Thematic Analysis of the Study.

Primary Organizing Theme	Secondary Organizing Theme
1) Health-seeking behavior	Beliefs associated with the product bought
	Experiences in using folk medicine
	Purpose of going to Quiapo
	Reasons for utilizing folk medicine
2) Folk medicine utilization	Medicinal use of product
	Product bought
	History of usage
3) Sources of knowledge	Source of information about Quiapo and its products

Figure 1. Illustration of the Thematic Analysis of the Study.



folk medicine culture and beliefs of their provinces, then that can also be a source of their knowledge on where to get the product they need. Lastly, beliefs and the experiences can be associated with each other. For instance, if they had a pleasant experience with the product or if the product indeed cured their illness, then it can be a basis for their beliefs regarding the product's effectiveness.

Discussion

The aims of this study were to understand the lived experiences of health-seeking individuals who acquire folk medicine services in Quiapo and to describe the meaning behind their acquisition of these services. Based on the authors' knowledge, this is the first qualitative study pertaining to the narratives of Filipinos who patronize Quiapo's folk medicine services.

Dubbed as the "Quiapo Medical Center," it is the center of folk medicine in the National Capital Region.[27] Although there is no actual Quiapo Medical Center in terms of infrastructure or institution, Filipinos will immediately think of herbal medicine, lucky charms and amulets, and other folk remedies when hearing the word Quiapo,[12,31,32] aside from the famous church and plaza.[10] Throughout the kiosks and stalls within the area, the immense availability of folk medicine proves to be one of the biggest factors of its popularity.

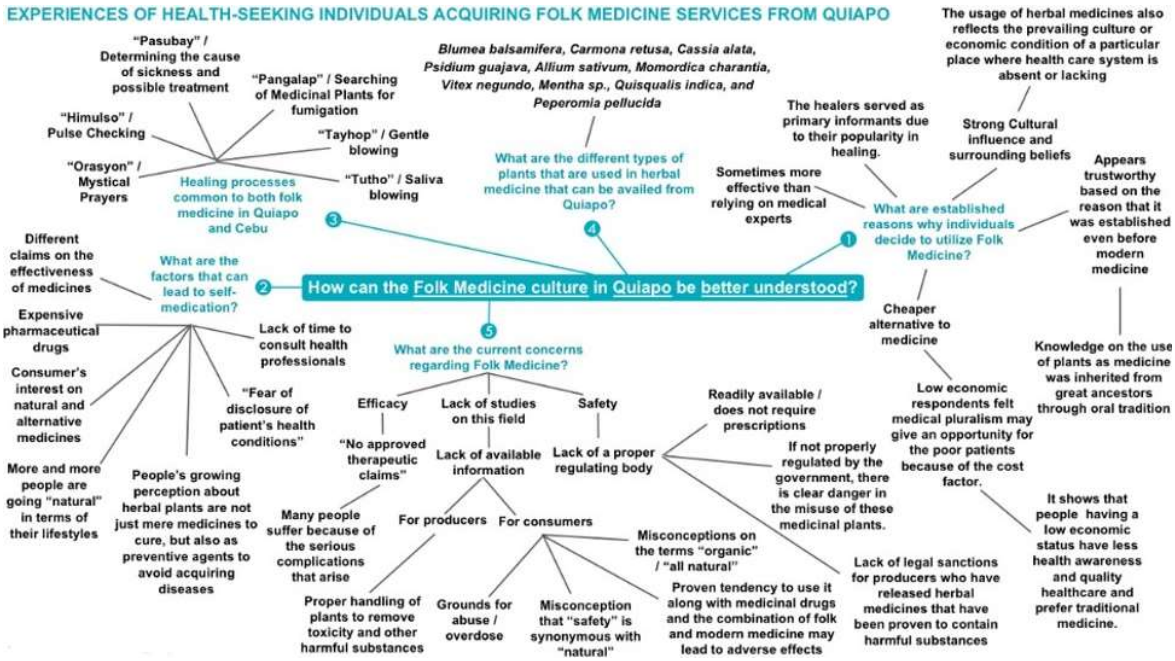
Local studies revealed that believers of folk medicine practices in the Philippines are mostly married Catholic females with low economic status and low educational attainment,[9,15] which is similar to the findings of the current study. Similar foreign studies have also found that consumers of traditional and complementary medicine are often females and married whose ages ranged within the average interval of fifty and whose education level is high school diploma.[33-35] These sociodemographic profiles were all evident in the findings of the present study. Another study also found that rural people have unique health-seeking behavior and mixed opinions about medical pluralism which explains the behavior of these health-seeking individuals.[17]
A local previous study identified species of plants being sold in Quiapo as herbal medicines.[12] The availability of medicinal plants in Quiapo and the way some Filipinos are patronizing them reflects the larger cultural diversity of the country. Some methods of folk remedies in another study also revealed to be similar in the present study which include boiling, concoction, and decoction.[15] Furthermore, most cultures have utilized herbal medicine to be effectual therapies for the treatment and even prevention of various diseases and ailments for centuries. With the modern advances of the internet, patrons now enjoy wider access to herbal products all around the globe.[36]

The influx of consumers acquiring folk medicine services from Quiapo supports the fact that a great part of the population still uses herbal medicine. One of the main reasons as to why individuals utilize folk medicine in previous studies is its use as a supplement to conventional medicine.[34,36] Its vast popularity and easy accessibility are the greatest factors that lead to self-medication. People who practice self-medication seem to heavily rely on natural and alternative medicine than their pharmaceutical drug counterparts. They assume that since these are considered natural remedies, it automatically equates to safety. It is alarming how alternative medicines are more readily available and can be conveniently purchased without the need for legitimate prescription from a physician. The resurgence of public interest in folk medicine is attributed to various statements regarding the effectiveness of plant or herbal-based medicines.[18] The trend is currently leaning towards going "natural". It is probable that the people's growing perception about herbal plants has led to its use as both curative and preventive.[12]

Given these growing concerns, it is evident that there is indeed a lack of both understanding and scholarly developments in the field of folk medicine. Inspired by all of these challenges and the urgency of how these concerns need to be addressed immediately, the genuine desire to bridge the gap remains steadfast along with the vision of this study to serve as a vital keystone that will pave the way towards understanding folk medicine in a deeper and more meaningful way. Regardless of how famous and vast the culture of folk medicine in Quiapo is, there seems to be a scarcity of related literature depicting its culture and this greatly contributes to the misconceptions of the people towards folk medicine.

The illustration below reveals the main concepts and ideas from previous studies on folk medicine that were deemed useful in relation to the context of the present study. Through this, the authors were able to correlate the present findings with that of the previous literature (***Figure 2***).

Figure 2. Comprehensive Map of Review of Related Literature of the Study



Contributions of the Study

Folk medicine culture in Quiapo has been considered a taboo by commoners who are usually non-believers of folk medicine practices. The authors believe that misconceptions towards the field are rooted in the lack of knowledge due to the lack of published literature and studies. This was realized by the authors while in the process of researching due to the evident scarcity of literature about folk medicine culture in Quiapo, despite extensive search efforts. This fueled the authors' motivation and ignited in them a new level of curiosity, pushing them to venture into the field with the hopes of shedding light on what truly happens behind the by-lines.

Through the lived experiences of the participants, the authors were able to reveal to the world some answers to the most important questions related to the field of folk medicine. This study was successful in its goal of providing a better understanding of the folk medicine culture in Quiapo by gathering primary data from first-hand interviews.

Strengths of the Study

The study delves into the experiences of each participant, which offers a wide spectrum of new information as the experience of one is unique from the others, regardless of background. Human experiences are powerful and are sometimes even more compelling as compared to quantitative data. In addition to this, the interviews are not limited to only a specific set of questions and can therefore be redirected in real-time to accommodate more information. The research direction and framework can then also be modified along with the new information that was gathered, offering data flexibility and robustness. With each question, a more profound sense of understanding of the participants' lived experience was attained. The approach is able to characterize even the slightest subtlety, and as well as complexities that a positivistic approach would have otherwise missed. More importantly, the study was able to obtain a demographically diverse set of data, wherein various trends and themes emerged, despite only having seven participants.

Limitations of the Study

The research quality is greatly reliant on the authors' individual skills and is more prone to the influence of their personal prejudices and peculiarities. This type of research heavily relies on the capability of the authors to analyze the situation and be able to ask relevant questions that would not confuse or in any way compromise the information being collected with any form of discrimination or bias. On the other hand, the authors' presence during data gathering, which is frequently inevitable in qualitative studies, can influence their responses. In addition, this study is limited to the mere conveyance and analysis of the lived experiences of its participants with folk medicine, most importantly how it has been an effective form of treatment to them and does not focus on proving whether these products are indeed scientifically proven to be effective.

Conclusion

Folk medicine is perceived by its patrons to be effective in alleviating health concerns. The acquisition of such products is attributed to satisfaction from prior experience, distrust in the current healthcare system, upkeeping of and belief in family tradition, and intention to supplement existing western medicine treatment.

Through the obtained data that tackled the lived experiences of the participants, this study was able to contribute the first qualitative data on the folk medicine culture in Quiapo. Therefore, this study has paved an avenue for a better understanding regarding such while contributing a solution to the scarcity of literature depicting its culture. This problem greatly contributes to the misconceptions of people towards folk medicine.

This study aids health professionals in learning about folk medicine and better understanding patients who patronize such, subsequently aiding them in providing a holistic treatment approach. A physician's effort in guiding a patient's desire of blending folk medicine with western medicine can help bridge communication gaps by providing opportunities for open-minded health education, establishing trust, and improving doctor-patient relationship, eventually leading to better treatment outcomes and overall experience for the patient.

For future research, this study recommends utilizing a larger sample size for data saturation, yielding more responses and newly gathered data about the topic at hand. Furthermore, future studies may shift the focus on *albularyos* and their perspective on human health and health-seeking behaviors.

References

1. Abion TJ, Apolinar NL, Atutubo MJ, Banatin PB, Javier CV, Lu RM, Rocha IC, Rondilla NA, Roque SJ, Solaiman-Balt A. Experiences of health-seeking individuals acquiring folk medicine services from Quiapo. Proceedings of the 17th National Health Research Forum for Action; 2018 Sep 19-20; Mandaluyong City, Philippines. Manila: Department of Health; 2018. p. 127-8.
2. Bhasin V. Medical anthropology: a review. Stud Ethnomed. 2007;1(1):1-20.
3. Society for Medical Anthropology. What is medical anthropology? United States: Society for Medical Anthropology; 2017. Cited Oct, 2020. Available from: http://www.medanthro.net/about/about-medical-anthropology/
4. Wangkheirakpam S. Traditional and folk medicine as a target for drug discovery. In: Mandal SC, Mandal V, Konishi T, editors. Natural products and drug discovery: an integrated approach. Elsevier; 2018. p. 29-56.
5. Fokunang CN, Ndikum V, Tabi OY, Jiofack RB, Ngameni B, Guedje NM, et al. Traditional medicine: past, present and future research and development prospects and integration in the National Health System of Cameroon. Afr J Tradit Complement Altern Med. 2011;8(3):284-95.
6. Gritto MJ, Nanadagopalan V, Doss A. Ethnobotanical survey of medicinal plants used by traditional healers in Shobanapuram village of Pachamalai Hill, Tamilnadu. Adv Appl Sci Res. 2015;6(3):157-164.
7. Panter-Brick C, Eggerman M. The field of medical anthropology in social science and medicine. Soc Sci Med. 2018 Jan;196:223-39.
8. Tan ML. Revisiting usog, pasma, kulam. Quezon City: University of the Philippines Press; 2010.
9. Rebuya NR, Lasarte, ES, Amador, MMA. Medical pluralism, traditional healing practices, and the Partido albularyo: challenges in inclusion. Open J Soc Sci. 2020;8:72-79.
10. Zialcita FN. Quiapo: heart of Manila. Quezon City: Ateneo de Manila University Press; 2006.
11. Abdullah F, Corrado J, Detros K, Galima A, Germo AG, Olaya D, Orinion G, Posadas K, Vidal L. Organized chaos: a cultural analysis of Quiapo [research project]. University of the Philippines; 2013.
12. Flores RL, Legario RA, Malagotnot DBM, Peregrin K, Sato RA, Secoya ER. Ethnomedicinal study of plants sold in Quiapo, Manila, Philippines. Scholars Acad J Biosci. 2016;4(4A):359-365.
13. Romero P. Mixing science and faith, herbal medicine markets offer-cures and jobs [Internet]. The Rockefeller Foundation; 2013. Cited Oct, 2020. Available from: https://nextcity.org/informalcity/entry/mixing-science-and-faith-herbal-medicine-markets-offer-cures-and-jobs.

14. World Health Organization. Traditional, complementary, and integrative medicine [Internet]. Geneva: World Health Organization; 2020 [cited 2021 Feb]. Available from: https://www.who.int/traditional-complementary-integrative-medicine/about/en/.
15. Cerio CT. Albularyo folk healing: cultural beliefs on healthcare management in Partido District, Camarines Sur, Philippines. J Southeast Asian Stud. 2020 Jun;25(1):210-237.
16. Petrovska BB. Historical review of medicinal plants' usage. Pharmacogn Rev. 2012 Jan;6(11):1-5.
17. Nanjunda D. Factors affecting health seeking behavior and medical pluralism among rural populations: implications for health care professionals. Sri Ramachandra J Med. 2014;7:1.
18. Ekor M. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. Front Pharmacol. 2014 Jan 10;4:177.
19. Montepio SN. Folk medicine in the Filipino American experience. Amerasia J. 1986;13(1):151-162.
20. Dayrit MM, Lagrada LP, Picazo OF, Pons MC, Villaverde MC. The Philippines health system review [Internet]. New Delhi: World Health Organization, Regional Office for South-East Asia; 2018. Cited Feb, 2021. Available from: https://apps.who.int/iris/handle/10665/274579.
21. Ulep VGT, Dela Cruz NAO. Analysis of out-of-pocket expenditures in the Philippines. Philipp J Dev. 2013;40(1-2d):93-123.
22. Tobe M, Stickley A, Del Rosario RB Jr, Shibuya K. Out-of-pocket medical expenses for inpatient care among beneficiaries of the National Health Insurance Program in the Philippines. Health Policy Plan. 2013 Aug;28(5):536-48.
23. Tumanan-Mendoza BA, Mendoza VL, Bermudez-Delos Santos AAA, Punzalan FER, Pestano NS, Natividad RB, et al. Economic burden of hospitalisation for congestive heart failure among adults in the Philippines. Heart Asia. 2018 Oct 10;10(2):e011039.
24. Udayanga S. Lay reflections of health experiences and Sinhalese medicine in Sri Lanka. Asian Anthropol. 2018 Nov;17(4):276-292.
25. Berdon JS, Ragosta EL, Inocian RB, Manalag CA, Lozano EB. Unveiling Cebuano traditional healing practices. Asia Pac J Multidiscip Res. 2016;4(1):51-59.
26. Robles W. (Un)lucky charms: amulet vendors of Quiapo church. Quezon City: Central Book Supply; 2009.
27. Tan ML. Anting-anting. Philippine Daily Inquirer. Last updated: Nov 11, 2015, cited Feb, 2021. Available from: https://opinion.inquirer.net/90210/anting-anting.
28. Joven AE. Review of the book traditional medicine in the colonial Philippines, 16th to the 19th century. Philipp Stud. 2020;68(1):130-133.
29. Abad PJ, Tan ML, Baluyot MM, Villa AQ, Talapian GL, Reyes ME, et al. Cultural beliefs on disease causation in the Philippines: challenge and implications in genetic counseling. J Community Genet. 2014 Oct;5(4):399-407.
30. Rocha ICN, Roque SJR, Tanyag LG, Reyes KA, Sigui MAMM. Effect of Citrofortunella microcarpa (calamansi) peelings on whole blood coagulation using blood samples from albino mice. J Complement Altern Med Res. 2020 Dec;12(1):51-56.
31. Tan ML. True or false. Philippine Daily Inquirer. Last updated: Jun 6, 2018, Cited Feb, 2021. Available from: https://opinion.inquirer.net/113721/true-or-false.
32. Tan ML. Nationalism and medicine. Philippine Daily Inquirer [Internet]. Last updated: Jun 13, 2018, cited Feb, 2021. Available from: https://opinion.inquirer.net/113892/nationalism-and-medicine.
33. Sivertsen K, Lukic M, Kristoffersen AE. Gender specific association between the use of complementary and alternative medicine (CAM) and alcohol consumption and injuries caused by drinking in the sixth Tromso study. BMC Complement Altern Med. 2018 Aug 13;18(1):239.
34. Kristoffersen AE, Broderstad AR, Musial F, Stub T. Prevalence, and health- and sociodemographic associations for visits to traditional and complementary medical providers in the seventh survey of the Tromso study. BMC Complement Altern Med. 2019 Nov 11;19(1):305.
35. Luketina-Sunjka M, Rancic N, Mihailovic N, Jakovljevic M. The Impact of the Socio-Demographic Characteristics of Complementary and Alternative Medicine Users in Serbia on OTC Drug Consumption. Front Public Health. 2019 Oct 24;7:303.
36. Rivera JO, Loya AM, Ceballos R. Use of herbal medicines and implications for conventional drug therapy medical sciences. Altern Integ Med. 2013 Jul;2(6).

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Original Article

Medical Students' Perception Towards the COVID-19 Pandemic in Mexico: Distance Learning, Assisting Hospitals, and Vaccination

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Abstract

Background: Mexico has been one of the most affected countries by the COVID-19 pandemic. Its health workers are playing a substantial role, but they are suffering from a high mortality rate, which highlights the need of prioritizing them for vaccination. Medical interns have reduced their practices, some continue to assist clinical rotations without the necessary protective equipment, and they are not being considered for vaccination. We wanted to determine the attitude of medical students and interns towards distance learning, assisting hospitals, and vaccination. **Methods:** We conducted a paired survey of a cohort of medical students who were evaluated twice, in June 2020 and in December 2020, using an online survey (32-online questions) to assess their perception of the pandemic. **Results:** We collected responses from 384 students in the summer period and 331 in the winter period; the majority were women from non-clinical semesters, and the median age of response was 21 years old (IQR 19 – 22). We found that the percentage of acceptance for vaccination was 95.6% in the summer and 93.7% in the winter, a remarkable acceptance in both periods. The percentage of students who reported having someone close to them with symptoms suggestive of COVID-19 was 38.5% in the summer, showing an increase to 77.6% in the winter. **Conclusion:** We observed that medical students had a positive attitude towards vaccination and that the probable COVID-19 cases among them have increased in just a few months.

Key Words: SARS-CoV-2; COVID-19; Vaccine (Source: MeSH-NLM).

Introduction

Mexico has suffered significantly during this pandemic, being the 3rd country with the highest mortality caused by COVID-19.[1] Mexican health care workers (HCW) are playing a substantial role in treating the virus, but they are one of the most affected populations.[2] Being a HCW is associated with higher odds of acquiring COVID-19, and with a higher mortality rate from the disease.[3]

Medical interns, medical students assisting to a rotating internship during their last years of their medical education, are critical as they attend to patients in hospitals and clinics, thereby preventing a breakdown of the national health care system. However, some medical interns are no longer assisting because of the pandemic.[4] This threatens their education, as well as the capacity of the health system.

In December 2020, Mexico started vaccinating COVID-19 first-line HCW.[5] Nevertheless, politicians and teachers have been vaccinated before them,[6,7] while the medical interns are not being considered. The national vaccination plan has been criticized for a "politicization" of the COVID-19 vaccine.[8] Until January 2021, Mexico was listed below the first 10 positions of vaccination per 100 people, being the country #19.[9]

The way of learning for the medical interns has radically changed due to the pandemic. Many schools opted for distant learning methods, and to reduce their clinical practices. The University Hospital "*Dr. José Eleuterio González*" from the *Universidad Autónoma de Nuevo León*" *(UANL)* suspended the first two years of its three-year medical internship, only continuing with the final year students, who have also reduced their practices. The rest of the students had no contact with the patients.[10]

We wanted to determine how the medical students and interns feel about distance learning, practices in hospitals, and vaccination, as well as attitudes towards the pandemic management.

Methods

The study was carried out among the medical student population of the *Universidad Autónoma de Nuevo León* (UANL). Medical interns in our hospital are those medical students who assist to a rotating internship during their final years of the education, while the students from the basic semesters belong to the first three years of the program and do not have clinical activities. Generally, the Mexican medical schools require just the medical students from the final year of the career to assist to the rotating internship, so our institution is an exception, and the reason for this is that it is a university teaching hospital where training starts earlier.

Students were evaluated twice, in June 2020 and in December 2020, using an online survey (32-online questions), and their responses were compared. We chose the month of December for the second period

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because Mexico was going to start its vaccination program that month.[11] The inclusion criteria for the study were to be a student from UANL medical school, be studying in any semester from the first to the twelfth, to give informed consent, and to be over 18 years old. Exclusion criteria were students at the medical school who were in their social service year -a service that is provided after having finished the career- and students who did not complete the survey and/or did not permit us to share the obtained data.

The 32-questions online questionnaire consisted of sociodemographic questions including age, city, semester, and gender, among others. We also asked for their affinity towards vaccination, use of unapproved medication, if they or someone close to them has had symptoms of COVID-19, fears about the pandemic, and affinity towards the distribution of information about the pandemic situation by the government. The questionnaire was proposed by the authors and was not validated. In most of the questions "yes" or "no" were the responses. The minimum sample size required to have a 95.5% confidence level, a margin of error of 5%, and heterogeneity of 50%, was calculated to be 366 students.

We shared the survey among the institutional student groups in the Microsoft Office Forms platform, and we closed the survey when 500 students had completed it. The students were invited to participate voluntarily, signing the corresponding informed consent. No economic material or academic compensation was offered. The students were evaluated twice with the same survey in two periods: summer period in June 2020 and winter period in December 2020. In the winter period a question was added regarding whether the students have become more interested in their relatives. In the winter period, the survey was only sent to the students who answered during the summer period.

For the statistical analysis, the studied sample was divided into 2 groups to address both periods (summer and winter). To identify the type of distribution of the variables, we used the Kolmogorov-Smirnov test. Continuous variables were represented by mean or median and interquartile index (IQR), and categorical variables as frequencies and percentages. Differences between nonparametric quantitative variables were evaluated with the Mann-Whitney U statistical test, and categorical variables were evaluated using the X^2-squared test or Fisher's exact test. A p-value of ‹0.05 was considered significant. The statistical analysis was performed using SPSS v.25.

Results

In the summer period, from the 500 responses, 384 students (79.5%) gave consent and were included in the study. The majority were women from basic science semesters, and the majority were residing in Monterrey, Mexico. The median age was 21 years old (IQR 19 – 22). In December, the total number of participants was 331 (86.2% from those who participated in summer), the median age remained the same, and the majority continued to be women, from 61.5% to 68.6% (only 9 women left the follow-up study). The percentage of students belonging to clinical semesters remained similar. The percentage of students outside the metropolitan area of Monterrey went from 23.4% to 17.2%. We found that the percentage of acceptance to the vaccination was 95.6% (N=367/384) in summer and 93.7% (N=310/331) in winter, showing a remarkable acceptance in both periods. It should be noted that in our population we found an important increase in the probable number of positive cases because the percentage of students who reported having someone close to them with symptoms suggestive of COVID-19 or stated that they were the symptomatic person was 38.5% (N=148/384) in the summer, increasing to 77.6% (N=257/331) in the winter (p-value ‹0.001). Those most affected by symptoms were the family, which had the highest increase in cases, followed by the symptoms in oneself. Among other results, the number of students that were following the national informs about COVID-19 decreased but not in a significant way from 83.3% to 80.4%. The percentage of students who believe in what they inform went from 70.6% to 80.4%. Finally, a loved one getting sick is one of the biggest fears in 90% of the students. Other variables can be seen in ***Table 1***.

Table 1. Comparison between summer and winter respondents.

Variable	Summer N=384 (%)	Winter N=331 (%)	p-value
Age (Q1-Q3)	21 (19 – 22)	21 (19 – 22)	0.190*
Medical Interns (7th-12th)	154 (40.1)	134 (40.5)	0.918
Basic semester (1st -6th)	230 (59.9)	197 (59.5)	0.918
Female students	236 (61.5)	227 (68.6)	0.047
Foreign students	90 (23.4)	57 (17.2)	0.040
Which of the following has had COVID-19 symptoms?			
Family	70 (18.2)	149 (45)	‹0.0001
Friend	44 (11.5)	51 (15.4)	0.121
Couple	2 (0.5)	5 (1.5)	0.259
You	32 (8.3)	52 (15.7)	0.002
None	236 (61.5)	74 (22.4)	‹0.0001
Have you been following the national coverage about COVID-19?			
Yes	320 (83.3)	266 (80.4)	0.303
Do you believe in them?			
Yes	271 (70.6)	266 (80.4)	0.003
Do you believe that it was needed more information about vaccination in the national informs about-COVID-19?			
Yes	285 (74.2)	307 (92.7)	‹0.0001
Would you use non-approved medications to avoid getting sick or to treat yourself in case of getting sick of COVID-19?			
Yes	45 (11.7)	52 (15.7)	0.120
Do you believe that vaccination should be mandatory?			
Yes	336 (87.5)	280 (84.6)	0.262
What are your three biggest fears during COVID-19 pandemic?			
A loved one getting sick.	343 (89.4)	301 (92.1)	0.472
Getting infected and infecting a loved one.	305 (79.4)	287 (86.7)	0.010
The economy of the family.	280 (72.9)	258 (77.9)	0.120
Have you struggled to study?			
Yes	199 (51.8)	258 (77.9)	‹0.0001
Have you become more interested in the people that matter to you?			
Yes	-	259 (78.2)	

Legend: *Mann–Whitney U test was used to analyze this variable.

Discussion

The curriculum of medical students varies throughout the world however, they all point in the same direction: developing the best skills of medical students to satisfactorily serve the patients. The first years of the education program correspond to the theoretical part of medicine, while in the final years the students integrate to hospitals and health centers, so they can learn about various medical specialties. Nevertheless, the COVID-19 pandemic has affected the theoretical and practical education of medical students all over the world.[12,13]

Many schools have implemented extraordinary options for students' best learning, for example, Garman *et al*[14] reports that students can participate through telecommunication to connect with patients and assist them. In our study, we found that by the winter period the 77.9% of medical students found it hard to study their subjects. We fear that

the pandemic could affect their knowledge and their interest in the career. New measures need to be taken by medical schools to help them.

Clinical practices are important to gain professional skills and to help our national health system, but Mexico has not been able to guarantee the protection of interns, which can play a crucial role when addressing the community needs in the COVID-19 pandemic.[15] In Mexico, some of them continue assisting hospitals as reported by Corte *et al*[16] where 16.14% of medical residents (the postgraduate training for becoming a specialist) claimed they still counted on the support of the medical interns. This may represent a threat to them because they have a high risk of getting infected or even dying.[17] We found an increase in the percentage of a probable number of positive cases among the medical students from summer to winter. If they are required to assist to health centers, then they should be vaccinated and protected with adequate equipment. Lack of personal protective equipment is a common cause of death among the HCW's especially in low-and middle-income nations.[18]

Providing final-year medical students the opportunity to graduate early to compensate for staff shortages during this crisis could be an effective strategy. Countries such as the United States have carried out this strategy with success.[19] In Mexico we could offer this option to the medical interns, but this needs to be voluntary, well paid, and with the proper use of personal protective equipment, otherwise ethical concerns may arise.

There are multiple ways by which medical students can be of assistance during this pandemic to gain professional experience and support our national health system. They can volunteer in primary healthcare centers, swab collection points, or hospitals to be engaged in low-risk activities.[20,21] Also, students can help by raising people's awareness of the COVID-19 pandemic or informing the elderly about the preventive measures. Most of our students followed the national informs about COVID-19, and would not consider non-approved drugs for COVID-19 treatment, meaning that they are being correctly informed and that they encourage an evidence-based approach of the COVID-19 disease. This can help their friends, family, and other people to be correctly informed. Turning to medical research and innovation to understand the pandemic and create solutions is another task in which a medical student can be engaged.[21]

The thoughts of the medical students that we found the most in our study included fears of being infected, fears of getting sick, and fears that a loved one gets sick. A previous study proves that there are increasing levels of anxiety due to COVID-19 among medical students, especially in female students, and in those who continue to assist to clinical rotations.[22] Enhancing medical students' health literacy skills reduces fear and improves their mental health because they can have access to health information during this pandemic for protecting their personal health and that of people they love.[23]

The next step to take during the COVID-19 pandemic is the vaccination of the HCWs and medical interns. In our study, the medical students appeared to be willing to be vaccinated in both periods, so they may be hoping that will happen soon. This desire becomes unlikely to happen in the next months if we consider the measures taken by the Secretary of Health of Mexico to control the pandemic, which has been strongly criticized. The main reasons are the lack of protection for the health personnel,[2] the limited amount of PCR tests made,[1] and a vaccination strategy that does not prioritize health personnel.[5]

To face the problem, the authors, especially those who are in their senior year have been closely involved in a series of demands seeking the vaccination of the medical interns as a priority. By March 2021, we showed the results of our research to the university authorities, started a work stoppage, and protested in front of the medical school. The final results were the registration of the medical interns in the national immunization registry for COVID doctors, ensuring of adequate protective equipment, and reduction of working hours.[24]

This study has many strengths, including size, a representative ratio of men to women, and good response rate for follow-up. Limitations of this study can be its descriptive methodology, and that we do not know how seriously the online survey was taken. The limitations can be addressed through in person surveys when the face-to-face classes become a reality, allowing expanding our results and conclusions.

In conclusion, we observed that the interns and medical students struggled to study their subjects, had a positive attitude towards vaccination, and that the probable COVID-19 cases among them and their family have increased in just a few months. Our results highlight the importance of prioritizing medical students in clinical years in vaccination strategies alongside or immediately after the other HCW due to their importance in teaching models and community clinical practice in university hospitals.

References

1. Mendez-Dominguez N, Alvarez-Baeza A, Carrillo G. Demographic and health indicators in correlation to interstate variability of incidence, confirmation, hospitalization, and lethality in Mexico: Preliminary analysis from imported and community acquired cases during COVID-19 outbreak. Int J Environ Res Public Health. 2020 Jun 15;17(12):1–12.
2. Agren D. Understanding Mexican health worker COVID-19 deaths. Lancet. 2020 Sept 19;396(10254):807.
3. Yamamoto-Moreno JA, Pineda-Aguilar C, Ruiz-Pérez S, Gortarez-Quintana GL, Ruiz-Dorado MA. SARS-CoV-2 Infection Among Healthcare Workers in Tijuana, Mexico: A cross-sectional study. Int J Med Students. 2020 Dec 9;8(3):220–5.
4. Valdez-García JE, López Cabrera MV, Jiménez Martínez M de los Á, Díaz Elizondo JA, Dávila Rivas JAG, Olivares Olivares SL. I'm getting ready to help: response from schools of medicine and health sciences to COVID-19. Investig en Educ Médica. 2020 Mar 29;9(35):85–95.
5. Government of Mexico. National policy against the SARS-CoV-2 virus, for the prevention of COVID-19 in Mexico. Available from: https://coronavirus.gob.mx/wp-content/uploads/2021/01/PolVx_COVID_-11Ene2021.pdf. Last updated: Jan 11, 2021; cited Mar 18, 2021.
6. Garduño R, Méndez E. Morena deputies ask for priority in vaccination against Covid. La Jornada; Mexico City; Jan 27, 2021; Available from: https://latinus.us/2021/01/27/diputados-morena-piden-prioridad-vacunacion-covid/. Last updated: Jan 27, 2021; cited Mar 18, 2021.
7. More than nine thousand teachers in Campeche, the only state in green, receive the vaccine against COVID-19. El Heraldo de México; Mexico City; Jan 25, 2021; Available from: https://heraldodemexico.com.mx/nacional/2021/1/25/mas-de-nueve-mil-docentes-en-campeche-unico-estado-en-verde-reciben-vacuna-contra-covid-19-249197.html. Last updated Jan 25, 2021; cited Mar 18; 2021.
8. Shabot E. Mexico and Iran: Politicization of Vaccines. Diario Judío; Mexico City; Jan 11, 2021; Available from: https://diariojudio.com/opinion/mexico-e-iran-politizacion-de-las-vacunas/351443/. Last updated Jan 11, 2021; cited Mar 18, 2021.
9. Richards T. With 670,000 doses given, vaccination falls short of objective by 40%. Mexico News Daily; Feb 1, 2021; Available from: https://mexiconewsdaily.com/news/coronavirus/vaccination-falls-short-of-january-31-objective-by-40/. Last updated Feb 1, 2021; cited Apr 23, 2021.

10. 1de la Cruz C. Medical education and coronavirus disease-19: Current experiences and upcoming challenges to be addressed. Med Univ. 2020 Oct 30;0ct;22:138.
11. Weiss S. Mexico launches coronavirus vaccination program. Deutsche Welle. Dec 22, 2020; Available from: https://www.dw.com/en/mexico-launches-coronavirus-vaccination-program/a-56034368. Last updated Dec 22, 2020; cited Mar 14, 2021.
12. Djoutsop Mbougo O, Youmbi Nono V, Kanmounye US. COVID-19 and Clinical Rotations in the Democratic Republic of Congo. Int J Med Students. 2020 Jul 02;8(2):177–9.
13. Subedi D, Bhandari S, Gaire A, Kandel M, Subedi S, Karki S. Knowledge, Attitude, and Practice Associated with COVID-19 Among School Students in Bharatpur, Chitwan District of Nepal. Int J Med Students. 2020 Dec 09;8(3):231–7.
14. Garman JC. COVID-19: Turning a Pandemic into a Learning Opportunity for Senior Medical Students. Int J Med Students. 2020 Dec 09;8(3):307–8.
15. O'Connor-Terry C, Gowda T, Zuchelkowski B, Minney S, Kwon J. Medical Students Have a Powerful Role in Addressing Community Needs in the COVID-19 Pandemic: An Experience from the US. Int J Med Students. 2020 Apr 18;8(1):70–2.
16. Cote Estrada L, Torres Cisneros R, Loera Torres MA, Campos Campos F, Zamora Godínez J, Cerda Cortázar L. Impact of the COVID-19 pandemic on the practice of General Surgery in Mexico. National Survey. Cir Gen. 2020 Jul 15;42(2):149–54.
17. Internal doctor dies from Covid-19; negligence is being reported. El Heraldo de México; Mexico City; Jul 07, 2020; Available from: https://heraldodemexico.com.mx/nacional/2021/1/7/muere-medico-interno-por-covid-19-denuncian-negligencia-242718.html. Last updated Jul 07, 2020; cited Mar 18, 2021.
18. Ing EB, Xu QA, Salimi A, Torun N. Physician deaths from coronavirus (COVID-19) disease. Occup Med (Chic Ill). 2020 May 15;70(5):370–4.
19. Pravder HD, Langdon-Embry L, Hernandez RJ, Berbari N, Shelov SP, Kinzler WL. Experiences of early graduate medical students working in New York hospitals during the COVID-19 pandemic: a mixed methods study. BMC Med Educ. 2021 Feb 18;21(1):1–11.
20. Bazan D, Nowicki M, Rzymski P. Medical students as the volunteer workforce during the COVID-19 pandemic: Polish experience. Int J Disaster Risk Reduct. 2021 Mar;55:102109.
21. Kinder F, Harvey A. Covid-19: The medical students responding to the pandemic. BMJ. 2020 Jun 15;369(June):1–2.
22. Saddik B, Hussein A, Sharif-Askari FS, Kheder W, Temsah MH, Koutaich RA, et al. Increased levels of anxiety among medical and non-medical university students during the COVID-19 pandemic in the United Arab Emirates. Risk Manag Heal Policy. 2020 Nov 03;13:2395–406.
23. Nguyen HT, Do BN, Pham KM, Kim GB, Dam HTB, Nguyen TT, et al. Fear of COVID-19 scale—associations of its scores with health literacy and health-related behaviors among medical students. Int J Environ Res Public Health. 2020 Jun 11;17(11):1–14.
24. Martínez A. Students protest in front of Medicine; they demand vaccines. El Norte; Monterrey; Mar 05, 2021; Available from: https://www.reforma.com/aplicacioneslibre/preacceso/articulo/default.aspx?__rval=1&urlredirect=https://www.reforma.com/protestan-alumnos-frente-a-medicina-exigen-vacunas/ar2137122?referer=--7d616165662f3a3a6262623b727a7a7279703b767a783a--. Last updated Mar 05, 2021; cited Mar 18, 2021.

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Short Communication

The Utility of Recycled Eyeglasses: A Pilot Study at the Los Angeles County Department of Health Services

Valerie P. Huang,[1] Mary E. Kim,[2] Sukriti Mohan,[3] Lauren P. Daskivich,[4] Jesse L. Berry.[5]

Abstract

Background: The cost of eyeglasses is variably covered by medical insurance and thus is a significant barrier for patients in lower socioeconomic classes. We evaluated the efficacy of Recycle Vision (RV) at LAC+USC Medical Center, a monthly clinic run by volunteer medical students that provides free donated eyeglasses. **Methods:** A convenience sample of 30 patients was surveyed from August 1, 2019 to December 31, 2019. Patients' prescriptions were matched with available eyeglasses based on spherical equivalent and axis of astigmatism using Winglasses software algorithm; patients selected glasses from these options based on subjective improvement of vision. All participants consented to a phone follow-up survey 1 month after initial visit to gauge satisfaction with glasses and rate difficulty in completing daily activities pre- and post-RV visit on a scale of 1 to 5 (5 being the greatest), with a 100% response rate. **Results:** Of the 30 study participants, 90% received eyeglasses from RV, with reported improvement in ease of daily activities of 3.96. 67% of respondents stated that if RV clinic did not exist, they would not have obtained glasses elsewhere; cost was the most commonly (70%) cited barrier. Upon follow-up, average likelihood of patients referring friends/family to RV was 4.07 (SD 1.14). **Conclusion:** The majority of RV patients received free eyeglasses and had subsequent improvement in their quality of life. This pilot study demonstrates that programs offering free eyeglasses can effectively correct refractive error and can offer a practical public health solution to improve functionality for underserved populations.

Key Words: Refractive Error Development; Visual Acuity; Low Vision (Source: MeSH-NLM).

Background

Vision loss is the third most common medical impairment,[1] with uncorrected refractive error being the leading cause of moderate or severe vision impairment.[2] Uncorrected refractive error includes myopia (near-sightedness), hyperopia (far-sightedness), presbyopia (loss of near vision with age), and astigmatism (commonly from an irregularly shaped cornea). These types of vision impairment can be assessed through a simple eye examination and require little more than a pair of eyeglasses to correct. However, the cost of refractive eyeglasses is variably covered by insurance and can present a significant barrier for patients, especially those in lower socioeconomic classes.[3] The World Health Organization estimates that 90% of the visually impaired live in low-income environments,[4] and prior studies have illustrated that societal factors are consistently a barrier in correcting vision impairment.[5] For example, Medi-Cal (California's version of Medicaid) vision benefits include a routine eye examination every 24 months, but only patients under 21 years old and residents of nursing homes receive complete coverage of eyeglasses.[6]

One specific program created to eliminate the monetary barrier of obtaining glasses is the Recycle Vision clinic at the Los Angeles County + University of Southern California (LAC+USC) Medical Center Eye Clinic. Our patient population is primarily low-income and/or underinsured with limited access to care outside of the County health system. Recycle Vision is a monthly clinic run by volunteer medical students that provides donated eyeglasses for free.

The purpose of this pilot study was:

1. To evaluate the efficacy of Recycle Vision clinic services in reducing vision impairment
2. To quantify its effect on patients' daily functioning
3. To determine patient satisfaction with receiving donated eyeglasses.

With these results, we hope to encourage other hospitals and clinics to implement similar programs for the visually impaired who do not have the financial means or access to obtain prescription eyeglasses.

Methods

This is a patient quality of life survey study conducted on LAC+USC patients who received glasses from Recycle Vision clinics in the 4-month period from August 1, 2019 to December 30, 2019. These clinics are held once a month for patients of LAC+USC ophthalmology; all patients who visit Recycle Vision clinic with a current prescription seeking eyeglasses are seen. The Winglasses computer algorithm is used to suggest the closest approximate matches based on the patient's spherical, cylindrical, and axis equivalent. Because the availability of glasses on-hand at Recycle Vision clinic is directly dependent on community donations, the number of potential matches can range from 3 to 10+ potential eyeglasses. Patients offered multiple choices of glasses based on optimization of the prescription parameters are then allowed to choose which pair of eyeglasses they feel best improves their vision impairment. This study met criteria outlined in the 45 CFR 46.104(d) category by the Department of Health and Human services meeting criteria for subjects' research and was thus approved by the University of Southern California iSTAR Internal Review Board,

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and the methods were in accordance with the guidelines of Declaration of Helsinki. STROBE guidelines were followed as applicable to guarantee the quality of this observational study.[7]

Data Collection and Analysis

Patients were asked if they were willing to participate in a short, written survey (*Supplementary Material*), and verbal consent was obtained. Patients were assured that this was a completely voluntary survey and that all information would be kept confidential and separate from their medical records; no demographics nor identifiable information was collected as part of the survey. All patients, regardless of survey participation, were trialed for a matching prescription eyeglasses through the services of Recycle Vision clinic.

The same day survey was conducted in English or Spanish, based on the preference of the patient. The consented patients were asked to list their phone number, so that they could be contacted for the one month follow up survey. Phone calls were completed by an author of this study (VH). The questions in the two surveys were either simple "yes/no" questions, or questions based on the Likert scale, a symmetric scale that is commonly used in survey-based studies. Survey questions can be seen in ***Table 1***. Primary measured outcomes included quality of life as measured by patient-reported improvement in ease of daily activities with Recycle Vision eyeglasses, and patient-reported likelihood of recommending Recycle Vision services. Excel was utilized to calculate both descriptive and inferential statistical tests.

Table 1. Compiled Clinic Survey Results.

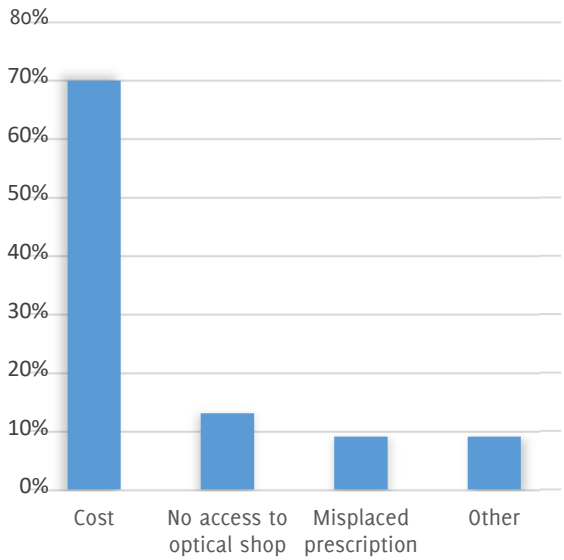
Characteristics	Mean (Standard Deviation) (scale of 1-5, 5 being greatest)	Number of Responses (n=30)
Number of participants who owned glasses pre-RV clinic		13 (43% of respondents)
Number of participants who did not own glasses pre-RV clinic		17 (57% of respondents)
Difficulty of completing daily tasks pre-RV for patients who previously owned glasses (scale of 1-5, 5 being most difficulty)	4.00 (SD 1.15)	13
Difficulty of completing daily tasks pre-RV for patients who did not own glasses (scale of 1-5, 5 being most difficult)	4.38 (SD 0.96)	17
Number of patients who stated that pre-RV glasses did not satisfy needs		9 (69% of respondents)
Comfort of new Recycle Vision (RV) glasses	3.59 (SD 1.23)	27
Reported frequency of wearing new RV glasses	3.81 (SD 1.21)	27
Amount of improvement in ease of daily tasks with new RV glasses	3.96 (SD 1.13)	27
Likelihood of recommending RV services	4.07 (SD 1.14)	30

Results

During the study period, 30 patients attended Recycle Vision clinic for eyeglasses services; all 30 patients consented and were included in this study. 100% of patients were successfully reached by phone for the second half of the survey, which was carried out between one to two months after the initial clinic visit. Of the 30 study participants, 90% (27/30) received a pair of glasses from Recycle Vision clinic and 10% (3/30) did not receive glasses due to lack of a suitable match.

Of the surveyed patients, 43% (13/30) owned glasses prior to visiting Recycle Vision clinic. Clinic survey results, as well as descriptive statistics, are listed in ***Table 1***. The mean level of self-reported improvement in ease of performing daily activities after receiving Recycle Vision glasses was 3.96 (on a scale of 1-5, with 5 being greatest), supported by participants reporting that they wore their glasses frequently and would be likely to recommend Recycle Vision clinic to others. Notably, 67% (20/30) patients responded that they would not have obtained glasses elsewhere outside of Recycle Vision clinic. Cost was the most common barrier, cited by 70% of survey respondents; other commonly cited reasons for this response are listed in ***Figure 1***.

Figure 1. Reasons Cited by Patients for not Obtaining Glasses Elsewhere if Recycle Vision Clinic Was not an Option.



A Mann Whitney U test was performed to compare the mean difficulty in completing daily tasks between those who owned glasses prior to visiting RV clinic (n=13), and those who did not own glasses prior to visiting Recycle Vision Clinic (n=17); the resulting summed ranks for each patient group totaled to 235 and 431, respectively. The calculated test statistic indicates that there was no significant difference between the two groups (p=0.86). The observed standardized effect size was calculated to be 0.029.

A Mann Whitney U test was also performed to compare the mean improvement in completing daily activities as reported upon survey one month after visiting Recycle Vision clinic between those who owned glasses prior to visiting Recycle Vision clinic and those who did not; the resulting summed ranks for each patient group totaled to 183 and 224, respectively. The calculated test statistic indicates that there was no significant difference between the two groups (p=0.79). The observed standardized effect size was calculated to be 0.050.

Discussion

Uncorrected refractive error is the most common cause of vision impairment worldwide, and the majority of those affected are of low socioeconomic status.[8] LAC+USC Medical Center primarily serves these low-income patients, as evidenced by the fact that roughly 75% of our patient population utilizes Medi-Cal or is uninsured. Since January 2020, Medi-Cal vision benefits only cover the cost of eyeglasses for patients under 21 years old and residents of nursing homes.[6] Unfortunately, there are only a few programs that offer eyeglasses at a discounted price in both developed and developing countries, such as the Scojo

Foundation[9] or the OneSight OnSite Voucher Program.[10] These programs are still limited, as services that are redeemable online require an internet connection and a valid credit/debit card, both of which can be difficult to obtain for patients of underserved populations.

The results of our study show that over half (57%) of patients who attended Recycle Vision clinic during the study time period did not previously own glasses. Out of the 13 patients who previously owned glasses, 69% self-reported that their previous glasses did not suit their needs, supported by their average difficulty of 4.00 out of 5 in completing daily tasks. Across all participants, the mean level of self-reported improvement in ease of completing daily tasks was 3.96 out of 5 after receiving Recycle Vision glasses, suggesting that our clinic was able to improve their vision. Studies have shown that the resultant economic burden in daily decrease in productivity outweighs the cost of correcting refractive error.[11,12] Thus, expansion of vision services such as Recycle Vision clinic for low-income patients could yield a net economic gain in daily household productivity and a reduction in unemployment numbers by patrons re-joining the workforce.[12]

The majority (53%) of surveyed patients indicated cost as the primary reason for not obtaining eyeglasses elsewhere. Previous studies have also found that lack of insurance or vision services coverage is directly related to the population's unmet need for eyeglasses.[13] However, since no insurance data was gathered to maintain anonymity, it is unclear if the limiting factor of cost of obtaining prescription eyeglasses is due specifically to lack of insurance coverage. For example, poor vision impairs one's capacity to navigate and understand programs that provide low-cost vision care, but patients could misattribute this as services being inaccessible.[13] Therefore, the lack of identifying demographic information prevents us from drawing conclusions about etiologies of identified barriers in obtaining prescription eyeglasses.

As this was a voluntary survey, one limitation of this study was inadvertently selecting for a biased group with positive responses not representative of the entire patient population. Additionally, we did not quantify each patients' total degree of refractive error with and without glasses, so reported improvements in vision were not standardized. Regardless, patients indicated significant subjective improvement in their daily functioning along with comfort and frequent daily use of their Recycle Vision eyeglasses; this is supported by their high reported likelihood of recommending Recycle Vision services to others. Previous studies have demonstrated that self-reported data on eyeglass use and vision impairment are reliable,[14,15] and this method aligned with our goal to evaluate patient satisfaction with recycled eyeglasses. Another limitation was that the Winglasses algorithm used in this study is proprietary and unable to be amended by the study authors; it takes into account prescription parameters from both eyes and attempts to find eyeglasses in the database that come close to an optimized value. Thus, eyeglass options that were offered to patients with severe uncorrected refractive error in only one eye were options that might subjectively worsen rather than improve vision overall. For procedure standardization, these patients were offered eyeglasses using the same algorithm. However, patients with drastically different prescriptions in each eye may benefit more from eyeglasses personalized to their exact prescription.

Lastly, this study was limited by small sample size, along with the fact that our surveyed population was all LAC+USC patients, which suggests a lower socioeconomic status than the general population. The effects of limited sample size were reflected in the results from the Mann Whitney U test. The calculated test statistic showed that there was no statistically significant difference in either the mean difficulty in completing tasks pre-clinic or in the mean improvement in completing daily tasks post-clinic between patients who previously owned glasses and patients who did not, suggesting that patients who owned glasses prior to Recycle Vision did not have up to date prescriptions and struggled equally as much as those who had no glasses at all. The results of Mann Whitney U test also showed that there was no significant difference in the mean improvement in completing daily activities between the participants who previously did and did not own glasses prior to visiting Recycle Vision clinic. It should be noted that LAC+USC is a tertiary care facility and as such, many patients who seek ophthalmologic care at these clinics have ocular disease in addition to simple refractive error. Because the survey used in this study did not incorporate questions that required patients to report the presence of presbyopia and the analysis did not quantitatively incorporate the improvement in visual acuity, our study cannot definitively report on whether prior ocular disease has an impact on the mean improvement in completing daily tasks. The low value of the calculated observed mean effect size illustrates the need for a larger sample size to reach statistical significance. However, we wanted to utilize preliminary results of this pilot study to illustrate the importance of these programs for underserved populations in seeking eyecare due to the relative paucity of current literature spotlighting these programs.

While these results may not be applicable to all eye clinics in the United States, they are useful in similar safety net patient populations and illustrate a problem with a simple solution. All patients in our study were referred to Recycle Vision clinic because they receive consistent eye care from LAC+USC but were unable to obtain glasses on their own. We hope that our patients' reported satisfaction and improvement in daily functioning will encourage other institutions to implement similar programs. Thankfully, there are several other similar clinics that already exist.[16,17] In future studies, we recommend larger sample sizes with longer follow-up to conclusively determine the long-term impact of clinics such as Recycle Vision. Additionally, we hope that future research can stratify patients, such as by the degree of refractive error, concurrent medical comorbidities, and socioeconomic and/or insurance status to better support programs that provide glasses for patients in lower socioeconomic classes with significant vision impairment.

References

1. Vos T, Allen C, Arora M. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016; **388**(10053): 1545-1602.
2. Flaxman SR, Bourne RRA, Resnikoff S, Ackland P, Braithwaite T, Cicinelli MV *et al.* Global causes of blindness and distance vision impairment 1990-2020: a systematic review and meta-analysis. *Lancet Glob Health* 2017; **5**(12): e1221-e1234.
3. Berry JL, Cuzzo LM, Bababeygy SR, Quiros PA. Unmet need for corrective eyeglasses: results from a Los Angeles County Hospital survey. *Int Ophthalmol* 2012; **32**(3): 245-50.
4. Global Initiative for the Elimination of Avoidable Blindness*: action plan 2006-2011*. World Health Organization: France, 2007.
5. Wang W, Yan W, Muller A, al e. Association of Socioeconomics With Prevalence of Visual Impairment and Blindness. *JAMA Ophthalmol* 2017; **135**(12): 1295-1302.
6. Services. DoHC. Medi-Cal Vision Benefits. In: State of California, 2020.
7. Gharaibeh A, Koppikar S, J. Bonilla-Escobar F. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) in the International Journal of Medical Students. *International Journal of Medical Students* 2014; **2**(2): 36-37.
8. Dandona L, Dandona R. What is the global burden of visual impairment? *BMC Med* 2006; **4**: 6.
9. Levin D. Scojo Foundation provides affordable eyeglasses to the poorest countries. In: *The New York Times*. Gopal Pet, India, 2007.

10. OneSight. Get Help. In: OneSight, 2020.
11. Naidoo KS, Fricke TR, Frick KD, al e. Potential Lost Productivity Resulting from the Global Burden of Myopia: Systematic Review, Meta-analysis, and Modeling. *Ophthalmology* 2019; **126**(3): 338-346.
12. Smith TS, Frick KD, Holden BA, al e. Potential lost productivity resulting from the global burden of uncorrected refractive error. *Bull World Health Organ* 2009; **87**(6): 431-7.
13. Baggett TP, O'Connell JJ, Singer DE, Rigotti NA. The unmet health care needs of homeless adults: a national study. *Am J Public Health* 2010; **100**(7): 1326-33.
14. Cumberland PM, Chianca A, Rahi JS, Eye UKB, Vision C. Accuracy and Utility of Self-report of Refractive Error. *JAMA Ophthalmol* 2016; **134**(7): 794-801.
15. Bowie H, Congdon NG, Lai H, West SK. Validity of a personal and family history of cataract and cataract surgery in genetic studies. *Invest Ophthalmol Vis Sci* 2003; **44**(7): 2905-8.
16. Bonilla-Escobar FJ. Fighting blindness with a Guerrilla: The Guerrilla Eye Service of Pittsburgh. *International Journal of Medical Students* 2017; **5**(3): 117-120.
17. Williams AM, Botsford B, Mortensen P, Park D, Waxman EL. Delivering mobile eye care to underserved communities while providing training in ophthalmology to medical students: experience of the Guerrilla Eye Service. *Clin Ophthalmol* 2019; **13**: 337-346.

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The Utility Of Recycled Eyeglasses: A Pilot Study At The Los Angeles County Department Of Health Services

Supplementary Material: Recycle Vision Patient Survey

Date *(fecha)*: _____

Phone number (*número de teléfono*): _____

Recorded Prescription *(Prescripción grabada)*: _____

Prescription of Glasses obtained (*Prescripción de los anteojos recibidos)*: _____

* Please circle one answer option for each of the following questions. *
* *Por favor, circule una opción de respuesta para cada de las siguientes preguntas.* *

Did you own glasses before visiting the Recycle Vision Clinic? Y / N
¿Tenías anteojos antes de participar en la Clínica de Recycle Vision? Sí / No

If yes, please answer the following two questions:
Si ya tiene anteojos, por favor responde a las siguientes preguntas:
Do your previous glasses meet your needs? Y / N
¿Sus anteojos presentes los satisfice sus necesidades? Sí / No

On a scale of 1 to 5 (maximum), please rate how difficult it is to complete your daily tasks with your current pair of glasses on:
En una escala de 1 a 5, 5 es lo máximo, evalúe lo difícil que es completer sus tareas diarias cuando está vistiendo sus anteojos presentes:
5 – very difficult (*muy difícil*)
4 – mostly difficult (*un poco difícil*)
3 –neither difficult nor easy (*ni difícil ni fácil*)
2 – a little easy (*un poco fácil*)
1 – very easy (*muy fácil*)

If you did not own glasses before visiting the Recycle Vision Clinic, on a scale of 1 to 5 (maximum), please rate how difficult it is to complete your daily tasks (e.g. driving, cooking, reading) without glasses:
Si no tenia anteojos antes de participar en la Clínica de Recycle Vision, en una escala de 1 a 5, 5 es lo máximo, evalúe lo difícil que es completer sus tareas diarias (e.g. conducir, concinar, leer):
5 – very difficult (*muy difícil*)
4 – mostly difficult (*un poco difícil*)
3 –neither difficult nor easy (*ni difícil ni fácil*)
2 – a little easy (*un poco fácil*)
1 – very easy (*muy fácil*)

If we did not host a Recycle Vision Clinic to give out free glasses, would you have obtained eyeglasses elsewhere? Y / N
Si no temenos una Clinica de Recycle Vision, ¿habrías obtenido anteojos en otro lugar? Sí / No

If not, why not? Please circle at least one answer choice, at most two choices below.
Sí no, ¿por qué? Por favor, circule por lo mínimo una, por lo máximo does de las siguientes opciónes de respuesta.

A. Cost (*costo de anteojos*)
B. No access to an optical shop / do not know how to find a shop (*no tengo acceso a una tienda óptica / no sé como encontrar una tienda óptica*)
C. Do not like wearing eyeglasses (*no me gusta usar anteojos*)
D. Lost my prescription / do not know what it is (*no sé mi prescripción / no sé donde esta mi prescripción*)
E. Other (*otro razón*)

Please answer the following questions 1 month after receiving glasses from Recycle Vision Clinic, on: (date)
Por favor, responda a las siguientes preguntas un mes después de recibir los anteojos de la Clinica Recycle Vision en: (date)
On a scale of 1 to 5 (most comfortable), please rate how comfortable your glasses are:
En una escala de 1 a 5, 5 es lo máximo, por favor evalúe la comodidad de los anteojos:
5 – very comfortable (*muy cómodo*)
4 – mostly comfortable (*un poco cómodo*)
3 – I am neither comfortable nor uncomfortable (*no estoy ni cómodo ni incómodo*)
2 – a little uncomfortable (*un poco incómodo*)
1 – very uncomfortable (*muy incómodo*)

On a scale of 1 to 5 (maximum), please rate how often you wear your glasses:
En una escala de 1 a 5, 5 es lo máximo, evalúe la frecuencia con que usa sus anteojos:
5 – all the time (*siempre*)
4 – most of the time (*la mayoría del tiempo*)
3 – sometimes (*a veces*)
2 – rarely (*raramente*)
1 – never (*nunca*)

On a scale of 1 to 5 (maximum), please rate the amount of improvement in your daily functioning since obtaining free glasses from Recycle Vision:
En una escala de 1 a 5, 5 es lo máximo, evalúe si hubo una mejora significada en su funcionamiento diario desde la obtenación de anteojos gratis de Recycle Vision:
5 – a lot of improvement (*mucha mejora*)
4 – some improvement (*un poco mejora*)
3 – no change (*es el mismo*)
2 – somewhat worse (*un poco peor*)
1 – much worse (*mucho peor*)

How likely are you to recommend the services of Recycle Vision to a family member?
¿Qué tan probable es que recomiende los servicios de Recycle Vision a un miembro de la familia?
5 – very likely (*muy probable*)
4 – somewhat likely (*probable*)
3 – neither likely nor unlikely (*ni probable ni improbable*)
2 – unlikely (*improbable*)
1 – very unlikely (*muy improbable*)

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Review

Childhood Adversity Linked to Neurological Circuitry Changes and Mental Health Disorders: A Narrative Review

Alexander L. Shand.[1]

Abstract

Children who experience adversity have an increased risk for psychiatric disorders. However, little is known about the exact alterations that occur in the neural circuitry and how that information may help lead to early diagnosis or preventive medicine. Research has shown that there are specific changes in neurological functional connectivity in the brain associated with childhood adversity. This review examined seventeen studies that investigated the correlation between changes in brain connectivity and specific psychiatric disorders. Specifically, it reviews articles that used imaging techniques to directly visualize functional connectivity changes in the brains of children exposed to adversity. Major findings to be discussed in more detail and in different disease states include stronger connectivity from the hippocampus, ventral striatum, amygdala, and in the medial lemniscus. Decreased connectivity strength was found in all the major projection, association, and commissural fiber pathways. Understanding these changes may help with preventive medicine by ensuring that clinicians monitor patients with more severe history of adversity who are therefore at higher risk for developing a psychiatric disorder. This paper will also address potential recommendations that could be implemented in the future as research offers more conclusive evidence. Research is now beginning to address the questions of whether these changes can be attenuated, either during childhood or as adults.

Key Words: Adverse Childhood Experiences, Functional Neuroimaging, Neural Pathways, Psychiatry, Psychopathology, Surveys and Questionnaires (Source: MeSH-NLM).

Introduction

There is currently no consensus among experts about how many children experience adversity, but estimates for the prevalence of childhood adversity (CA) range from twenty-five percent[1] to eighty percent.[2] These prevalences are dependent on the cohort examined and there are many more estimates in between these extremes.[3-5] Of adolescents in the United States, approximately twenty-percent are affected by mental illness each year.[6] There is a link between exposure to childhood adversity and development of mental health disorders,[7] however quantitative values remain unknown due to other factors such as heritability.[8] It should be noted that while there is a definite association,[7] it cannot yet be confidently stated that that there is a causal relationship.

Within the past twenty-five years, research has demonstrated definitive links to specific long-term effects caused by CA.[7,9-12] The Adverse Childhood Experiences (ACE) survey is the study that first established links between CA and medical disease such as ischemic heart disease, chronic lung disease, cancer, liver disease.[9] Other medical diseases associated with CA include diabetes,[13] cardiovascular disease,[14] stroke, obesity, chronic obstructive lung disease, autoimmune disease, sexually transmitted disease, and reduced life expectancy.[15]

In addition to links between CA and medical disease, it is also well established that adversity in children is associated with increased risk for psychiatric disorders.[7] The most common psychiatric issues that develop as a result of CA are depression, bipolar disorder, anxiety, eating disorders, suicidal ideation, conduct disorders, and substance use disorders. Of note, for each of these negative consequences there is a dose-dependent relationship between CA exposure and likelihood of development.[7]

Research then shifted to examine how adversity affects structure, volume, and morphology of the brain, and again many significant and consistent correlations were found; most regions in the brain had decreased volumes. CA exposure causes decreased volumes of the hippocampus, dorsolateral prefrontal cortex, medial prefrontal cortex, orbitofrontal cortex, anterior cingulate cortex, and cerebellum. [10,11] There is conflicting evidence regarding the amygdala and corpus callosum, with some studies identifying increased volumes, but others showing no significant change.[10]

Moving forward, work then began to look at activity within individual regions of the brain, without yet focusing on connections between regions.[12] In people with a history of CA, regions that are hyperactive in response to emotional stimuli include the amygdala, superior temporal gyrus, parahippocampal gyrus, and insula.[12]

There is substantial evidence that childhood adversity affects neurodevelopment and susceptibility to medical disease and psychopathology. However, there is not much evidence demonstrating specific inter-regional connectivity changes in the neurological circuits and the precise mechanisms of how they contribute to the development of mental health disease. These brain changes are the focus of much of the current research, and the focus of this paper which will review the specific changes in functional connectivity and signaling between regions of the brain in children exposed to adversity. It will also look at the level of the strength of the connectivity between regions and will review the evidence linking these changes to mental illness. Finally, it will discuss how this knowledge could contribute to preventive medicine.

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Methods

Search Strategy and Selection Criteria

Studies were selected by searching in PubMed Central. The first search criteria was [adverse childhood experiences] AND [MRI] which yielded 61 results. To expand the scope, the second search criteria was [childhood adversity] AND [MRI] which yielded 1068 results. These results were too vague and diverse. To limit the scope, we focus on only those studies that related to functional connectivity. Thus, the third search criteria was [childhood adversity] AND [connectivity] which yielded 924 results. The search was not restricted by any means. Using date filters, we found that from January 1, 2000 – December 31, 2008 only 6 articles were published that met the search criteria. From January 1, 2009 – December 31, 2014 an additional 211 articles were published matching the criteria. Then from January 1, 2015 – February 28, 2020 and additional 730 articles were published. This rapid and robust increase in results matching the search terms implies a shift towards studies relating to whole brain neural mapping and functional connectivity. This rising field of research is where we decided to focus this review. We tried to narrow the scope of this paper to one single variable of childhood adversity and how it relates to functional connectivity changes that can be visualized, and then how it can be used as a factor to predict psychiatric illness. For this review, we included papers from January 1, 2000 – February 28, 2020. All records produced from the search were in English, so we did not have to translate any paper. We focused only on studies that examined connections between two separate regions in the brain and their influence on one another, and on studies that directly visualized the brain using imaging techniques. If a study examined the activity of a single region it was excluded, because functional connectivity by definition must involve the interaction between two regions of the brain. To focus on solely functional connectivity changes in CA, studies related to only structural, morphological, or volumetric alterations were also excluded.

Any studies related to neurochemical alterations that used measurement techniques other than imaging, such as blood tests, were excluded. Any studies related to underlying genetic causes of pathway changes were also excluded. Using these criteria, a total of seventeen studies were found that relate childhood adversity and visualization of functional connectivity changes in neurological circuits (***Figure 1***).

Adversity Assessment

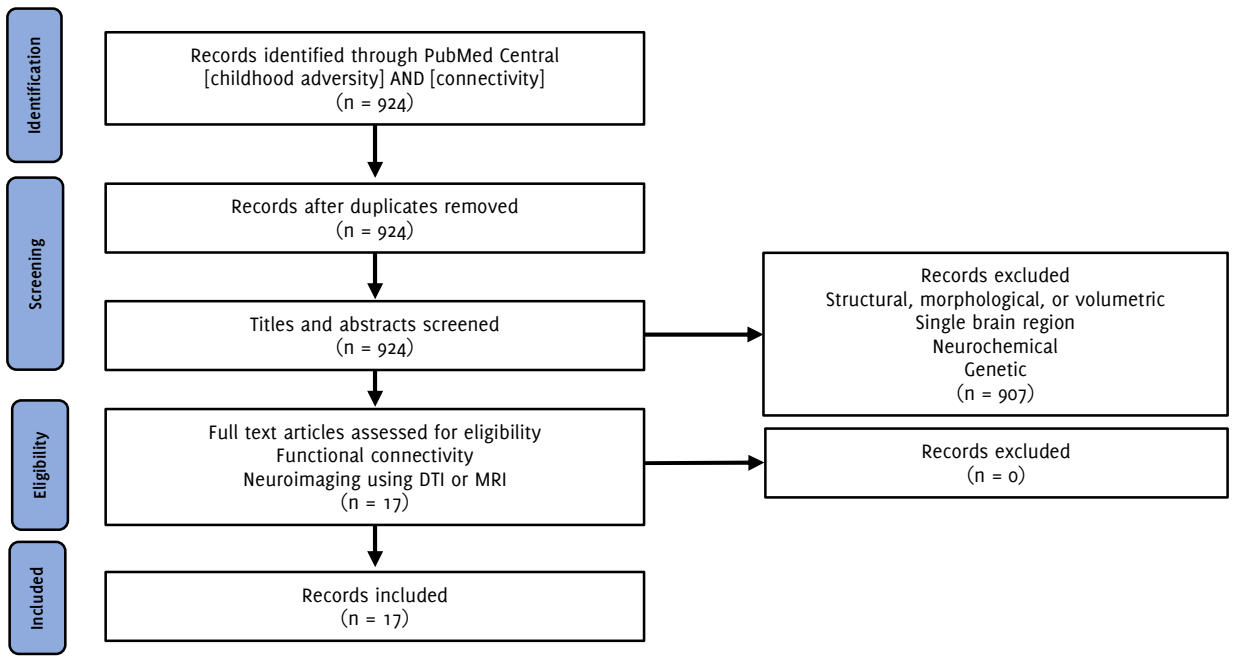
Over time attempts to define childhood adversity have been made in order to maintain consistent terminology. However, due to the fact that children have vastly different experiences, it is difficult to have a common dialect with consistent definitions. With the exception of ACE, most terminology is used arbitrarily, although occasionally it reflects which questionnaire was used in a study. Common terms used to describe adversity in childhood include adverse childhood experiences, childhood adversity, early life maltreatment, early life stress, negative childhood experiences, negative stressful life events, parental verbal abuse, witnessing domestic violence, low socioeconomic status, and being bullied

Because there is no uniform definition of adversity, many different study methods are used to categorize and quantify these subjective experiences. Questionnaires are used to create a numerical value from subjective experiences in order to adequately compare subjects. The questionnaires used in the studies reviewed here are the childhood adversity interview,[16] childhood trauma questionnaire,[17] early life stress questionnaire,[18] stressful life events schedule,[19] risky family questionnaire,[20] verbal abuse questionnaire,[21] child and adolescent psychiatric assessment,[22] and the Yale-Vermont adversity in childhood scale.[23] It is important to recognize that there are spectrums of severity with each questionnaire.

Diffusion Tensor Imaging and Fractional Anisotropy

Neural connections in the brain can be examined using a variety of methods, commonly by either diffusion tensor imaging (DTI)[24] or magnetic resonance imaging (MRI) and its subtypes.[25] DTI looks at the integrity of axons and is used as an approximation of the integrity of myelin.[26] DTI uses fractional anisotropy (FA) to assess fasciculi and bundles of axons traveling together. Thus, DTI and FA look at the commissural, projection, and association fibers.[27] Specifically, FA assesses myelination by measuring the direction of water movement along axons, and DTI provides a means of visualizing that movement.[24] Without detailing the specifics, it should suffice to know that a low FA value signifies a less dense bundle of axons, and an increased FA value signifies a more dense bundle of axons.[24] Simply put, white matter integrity is either increased or decreased, and thus is an indicator of connectivity strength.

Figure 1. PRISMA Flow Diagram of Literature Search



Nine studies in this review used DTI and FA to look at fasciculi and bundle connections. Three of these studies looked at individuals who had CA and no psychiatric disorders,[28-30] and compared them to a control group consisting of adults who had no history of CA and no mental health disorder. Six of these studies looked at patients who had a history of CA and have a psychiatric disorder such as: bipolar disorder,[31] major depressive disorder,[32] major depressive disorder with bullying,[33] schizophrenia,[34] substance abuse,[30] or trait anger.[35] These six studies used control groups of adults with a history of CA but have no psychiatric disorder.

Functional MRI and BOLD Signal

Unlike DTI which examines specific pathways, functional MRI (fMRI) looks at the activation of specific individual regions in the brain. It can additionally be used to visualize connections between regions in the brain,[25] which may or may not have an associated specific fasciculi or bundle. The neural activity is measured using a blood oxygen level dependent (BOLD) signal, which can be used to assess functional connectivity. Assessment of inter-regional connections is accomplished by looking at the activity of one region (the seed) and how another region (the target) reacts.[36] Functional connectivity is described as either positive or negative; positive connectivity means the seed region activates the target region more, and negative connectivity means the seed region does not activate the target as much. We will be consistent with terms for functional connectivity, where stronger connectivity refers to either more positive or less negative connections; and weaker connectivity refers to either more negative or less positive connections.

Eight studies used MRI and BOLD to look at neural circuitry and functional connectivity between regions in the brain. None of the studies looked at changes in healthy adults; all eight studies looked at adults with a psychiatric disorder who had been exposed to adversity in childhood. These studies used control groups composed of adults who had experienced CA but do not have any psychiatric disorder. The disorders studied were borderline personality disorder,[37] major depressive disorder,[38] offspring of bipolar parents,[39] post-traumatic stress disorder,[40] trait anger,[41] internalizing symptomatology,[42] and externalizing symptomatology.[43] Psychiatric disorders can be broadly classified into internalizing and externalizing. Although these terms are not regularly used in practice, they are applied in some studies. Internalizing symptoms include anxiety, depression, somatic symptoms, positive affect, and interpersonal relations. Externalizing symptoms are related to poor impulse control and include drinking alcohol, attention deficit hyperactivity disorder, oppositional defiant disorder, and conduct disorder. For each study, ***Table 1*** summarizes the type of adversity, which questionnaire was used, testing conditions, associated mental disorders, and imaging technique used.

Table 1. Assessment of the Methods Used by Each Study

Questionnaire	Adversity Type	Mental State	Task	Imaging	Reference
VAS	PVA	No Disorder	Resting state	DTI	Choi et al. 2009
CTQ	WDV	No Disorder	Resting state	DTI	Choi et al. 2012
CAI	ACE	No Disorder, Depression, Substance Abuse	Resting state	DTI	Huang et al. 2012
RFQ	ACE	Bipolar	Resting state	DTI	Benedetti et al. 2014
RFQ	ACE	Depression	Resting state	DTI	Poletti et al. 2018
ELSQ	ELS	Depression + Bullying	Resting state	DTI	Graziano et al. 2019
RFQ	ACE	Schizophrenia	Resting state	DTI	Poletti et al. 2015
CTQ	CA	Trait Anger	Resting state	DTI	Kim et al. 2019
RFQ	ACE	Borderline PD	Negative emotion	fMRI	Vai et al. 2017
CAPA	Poverty	Depression	Resting state	fMRI	Barch et al. 2016
SLES	nSLE	High risk offspring bipolar	Negative emotion	fMRI	Hanford et al. 2019
Direct	Assault	PTSD	Resting state	fMRI	Zielinski et al. 2018
CTQ	CA	Trait Anger	Negative emotion	fMRI	Kim et al. 2018
CTQ	Maltreatment	Internalizing	Positive reward	fMRI	Hanson et al. 2018
CAPA	Longitudinal CA	Externalizing	Resting state	fMRI	Barch et al. 2018
CTQ	Abuse	Externalizing	Negative emotion	fMRI	Peverill et al. 2019
Y-VACS	Maltreatment	Positive support	Negative emotion	fMRI	Wymbs et al. 2020

Legend: ACE: Adverse Childhood Experience; CA: Childhood Adversity; CAI: Childhood Adversity Interview; CAPA: Child and Adolescent Psychiatric Assessment; CTQ: Childhood Trauma Questionnaire; ELS: Early Life Stress; ELSQ: Early Life Stress Questionnaire; nSLE: Negative Stressful Life Event; PD: Personality Disorder; PTSD: Post Traumatic Stress Disorder; PVA: Parental Verbal Abuse; RFQ: Risky Families Questionnaire; SLES: Stressful Life Event Schedule; VAS: Verbal Abuse Scale; WDV: Witness Domestic Violence; Y-VACS: Yale-Vermont Childhood Adversity Scale

Results

Table 2a and ***Table 2b*** are separated by DTI and fMRI studies, and each represents the functional connectivity in each single pathway and the associated disorders. If imaging is obtained, ***Table 2*** is clinically useful because visualizing an affected pathway may help narrow down possibilities of what psychiatric disorders could develop. Another way the data could be organized is by the functional connectivity changes of each single disorder and all the pathways affected. This is useful for research purposes in identifying the pathways affected in a known disorder. However, this is not as clinically relevant because, at the current stage of treatment, the disorder(s) is already diagnosed in a patient and therefore the affected pathways cannot be reversed.

DTI: Tracts Assessed

Weaker connectivity was observed in nearly every pathway in individuals exposed to CA and was independent of whether the subjects were healthy or had a psychiatric diagnosis.[28-35] In total from the DTI studies, sixteen tracts were found to have decreased connectivity and two tracts to have stronger connectivity (***Table 2a***).

The tracts with stronger connectivity were the medial lemniscus and posterior corona radiata in individuals who were depressed and had a history of being bullied.[33] However, the finding of increased connectivity in the left posterior corona radiata[33] is opposite to findings from three other studies, which all noted decreased FA in the corona radiata.[31,34,35] In particular, two papers specifically noted the left hemisphere was decreased,[31,34] and one did not specify laterality.[35]

Table 2a. **Diffusion Tensor Imaging.** Change in Connectivity Strength Arranged by Affected Pathway and Associated Psychiatric Disorders

Pathway Affected	Connectivity Strength	Mental State	Reference
Diffusion Tensor Imaging and Fractional Anisotropy (FA)			
Arcuate fasciculus (in superior temporal gyrus)	Weaker (Decreased FA)	No Disorder	Choi et al. 2009
Cingulum bundle to cingulate gyrus to hippocampus	Weaker (Decreased FA)	No Disorder, Bipolar, Depression, Schizophrenia, Substance Abuse	Choi et al. 2009, Benedetti et al. 2014, Poletti et al. 2018, Poletti et al. 2015, Huang et al. 2012
Corona radiata	Weaker (Decreased FA)	Bipolar, Schizophrenia, Trait Anger	Benedetti et al. 2014, Poletti et al. 2015, Kim et al. 2019
Corona radiata (posterior left)	Stronger (Increased FA)	Depression + Bullying	Graziano et al. 2019
Corpus callosum (genu, body, and splenium)	Weaker (Decreased FA)	No Disorder, Bipolar, Depression, Schizophrenia, Trait Anger	Huang et al. 2012, Benedetti et al. 2014, Poletti et al. 2018, Poletti et al. 2015, Kim et al. 2019
External capsule	Weaker (Decreased FA)	Trait Anger	Kim et al. 2019
Forceps major	Weaker (Decreased FA)	Depression	Poletti et al. 2018
Forceps minor	Weaker (Decreased FA)	Bipolar, Depression	Benedetti et al. 2014, Poletti et al. 2018
Fornix body	Weaker (Decreased FA)	No Disorder	Choi et al. 2009
Inferior fronto-occipital fasciculus	Weaker (Decreased FA)	No Disorder, Bipolar, Depression	Huang et al. 2012, Benedetti et al. 2014, Poletti et al. 2018
Inferior longitudinal fasciculus	Weaker (Decreased FA)	Depression, Schizophrenia, No Disorder	Poletti et al. 2018, Poletti et al. 2015, Choi et al. 2012
Internal capsule	Weaker (Decreased FA)	Depression	Poletti et al. 2018
Sagittal striatum	Weaker (Decreased FA)	Trait Anger	Kim et al. 2019
Superior fronto-occipital fasciculus	Weaker (Decreased FA)	Trait Anger	Kim et al. 2019
Superior longitudinal fasciculus	Weaker (Decreased FA)	No Disorder, No Disorder, Bipolar, Schizophrenia, Trait Anger	Huang et al. 2012, Benedetti et al. 2014, Poletti et al. 2018, Poletti et al. 2015, Kim et al. 2019
Thalamic radiation	Weaker (Decreased FA)	Bipolar, Depression, Schizophrenia, Trait Anger	Benedetti et al. 2014, Poletti et al. 2018, Poletti et al. 2015, Kim et al. 2019
Uncinate fasciculus (amygdala to dlPFC)	Weaker (Decreased FA)	Bipolar, Trait Anger	Benedetti et al. 2014, Kim et al. 2019
Medial lemniscus	Stronger (Increased FA)	Depression + Bullying	Graziano et al. 2019

DTI: Individual pathways affected in multiple disorders

Of the tracts with decreased connectivity, nine were associated with multiple disorders (***Table 2a***). Thus, it cannot be stated that they have a direct correlation to developing a particular disorder if their connectivity strength is decreased. The tracts with decreased connectivity associated with multiple disorders are the cingulum bundle,[30-32,34] corona radiata,[31,34,35] corpus callosum,[31,32,34,35] forceps minor,[31,32] inferior fronto-occipital fasciculus,[30-32] inferior longitudinal fasciculus,[29,32,34] superior longitudinal fasciculus,[30-32,34,35] thalamic radiations,[31,32,34,35] and the uncinate fasciculus.[31,35]

DTI: Unique pathway changes associated with a single disorder

Seven of the tracts with decreased connectivity were associated with only a single disorder (***Table 2a***). The arcuate fasciculus was decreased in adults exposed to adversity but without any disorder.[28] The body of the fornix was decreased in subjects without any disorder.[28] The external capsule, the sagittal striatum, and the superior fronto-occipital fasciculus were decreased in trait anger.[35] The forceps major and the internal capsule were decreased in depression.[32]

fMRI: Individual pathways affected in multiple disorders

Connections from the amygdala to other regions are altered in trait anger,[41] borderline PD,[37] depression,[38] PTSD,[40] and children of bipolar parents at high risk for developing bipolar disorder themselves.[39] The amygdala is an emotional control center, thus children who experience adversity are conditioned to control their emotions more, and therefore there could be stronger connections from the amygdala. In support of this, several studies did find stronger connections from the amygdala

***Table 2b*. Functional Magnetic Resonance Imaging.** Change in Connectivity Strength Arranged by Affected Pathway and Associated Psychiatric Disorders

Pathway Affected	Connectivity Strength	Mental State	Reference
Amygdala activity High and no increase dlPFC activity	Weaker (Negative)	Trait Anger	Kim et al. 2018
Amygdala to cerebellum vermis to dorsolateral prefrontal cortex to dorsomedial prefrontal cortex to lateral superior occipital cortex to lingual gyrus to precuneus to subgyral region to superior parietal lobule	Stronger (Reduced Negative) or (More Positive)	Depression, Borderline PD, High risk offspring bipolar	Barch et al. 2016, Vai et al. 2017, Hanford et al. 2019
Amygdala to ventral anterior cingulate gyrus to ventral anterior superior frontal gyrus	Weaker (Reduced Positive)	PTSD	Zielinski et al. 2018
Dorsal anterior cingulate cortex to angular gyrus to lingual gyrus to precuneus	Weaker (Reduced Positive)	PTSD	Zielinski et al. 2018
Hippocampus to superior frontal cortex	Stronger (Reduced Negative)	Depression	Barch et al. 2016
Inferior frontal gyrus to culmen cerebellum to cuneus to inferior parietal lobule to precentral gyrus	Weaker (More Negative)	Externalizing	Barch et al. 2018
Rostral anterior cingulate cortex to precuneus rACC to ventral anterior superior frontal gyrus	Weaker (Reduced Positive)	PTSD	Zielinski et al. 2018
Ventral striatum to medial prefrontal cortex	Stronger (More Positive)	Internalizing (MDD)	Hanson et al. 2018
Ventromedial prefrontal cortex (mOFC & sgACC) to amygdala	Weaker (More Negative)	Externalizing	Peverill et al. 2019
Orbital frontal cortex	Stronger (More Positive)	Positive support	Wymbs et al. 2020
Amygdala	Stronger, not as much	Positive support	Wymbs et al. 2020
Anterior cingulate cortex	(Less increase vs control)		
Frontal pole			
Insula			
Nucleus accumbens (part of ventral striatum)			

Legend: dlPFC: Dorsolateral Prefrontal Cortex; PD: Personality Disorder; PTSD: Post Traumatic Stress Disorder; rACC: Rostral Anterior Cingulate Cortex; MDD: Major Depressive Disorder; mOFC: Medial Orbitofrontal Cortex; sgACC: Subgenual Anterior Cingulate Cortex

to multiple other regions including the cerebellar vermis, dorsolateral prefrontal cortex, dorsomedial prefrontal cortex, precuneus, subgyral region,[37] lingual gyrus,[38] lateral superior occipital cortex, and superior parietal lobule.[39]

Two studies found weaker connections from the amygdala. One pathway was a less positive BOLD from the amygdala to both the ventral anterior cingulate gyrus and ventral anterior superior frontal gyrus.[40] The other pathway was a decreased FA in the uncinate fasciculus from the amygdala to the dorsolateral prefrontal cortex (dlPFC).[35] Of note, two studies looked at seed and target region activity in the same pathway from the amygdala to the dorsolateral prefrontal cortex.[37,41] They found opposite results, but in different disease states, indicating a possibly pertinent future question. In borderline personality disorder, an increased positive association was found from the amygdala to dlPFC,[37] meaning that high amygdala activity results in high dlPFC activity. Contrastingly, in trait anger a negative association was found from amygdala to dorsolateral prefrontal cortex,[41] meaning that a high amygdala activity results in less response from the dlPFC. Thus, in both cases the amygdala was hyperactive, but there is a stronger dlPFC response in borderline PD,[37] and a weaker dlPFC response in trait anger.[41]

In normal emotion processing, the amygdala activates the prefrontal cortex (PFC), which feeds back to downregulate the amygdala, thus creating a normal negative association from the PFC to amygdala. One study looked at this feedback response while monitoring subject's negative emotional response; specifically, they looked at the pathway from the ventromedial PFC (vmPFC) to the amygdala.[44] They found a weaker (i.e. more negative) connection between the ventromedial PFC to amygdala, indicating that the vmPFC was unable to downregulate the amygdala. Furthermore, they found that the connection became even weaker with an increasing severity of ACE. In other words, children exposed to ACE have less downregulation of the activation of the amygdala.

One study looked at connections form the dorsal anterior cingulate cortex to multiple other regions, and all these pathways were weaker if a subject had been exposed to childhood adversity.[40] Several pathways from the inferior frontal gyrus to multiple regions were all found to have more negative connectivity in individuals with externalizing symptomatology.[43] The rostral anterior cingulate cortex was found to have weaker connectivity to the precuneus and the ventral anterior superior frontal gyrus in PTSD adolescents.[40] These studies indicate that the majority of pathways affected are usually weakened in children exposed to adversity.

fMRI: Unique pathway changes associated with a single disorder

Of note there are some single pathway changes that have only been found in one disease. The pathway from the hippocampus to the superior frontal cortex was found to have stronger (i.e. less negative) connectivity in people with depression.[38] Stronger connectivity was found from the ventral striatum to the medial prefrontal cortex in people with internalizing symptomatology.[42] This could be significant

because knowing a single pathway change could help predict the singular disorder outcome; however more research needs to be done on this topic.

The following is a summary of all the major findings discussed in this review. Stronger connectivity was noted from the hippocampus to the superior frontal cortex in depression,[38] from the ventral striatum to the medial prefrontal cortex in depression,[42] in the medial lemniscus in people who were bullied with depression,[33] and from the amygdala to most target regions in depression,[38] borderline PD,[37] and offspring of bipolar parents.[39] Findings in the corona radiata are unclear because some studies note weaker association,[31,34,35] while other studies note stronger connectivity.[33] All other pathways had weaker connectivity, including some other pathways from the amygdala. ***Figure 2*** shows white matter tracts,[45] most of which are affected by childhood adversity.

Severity of adversity is positively correlated with severity of disorder

Severity of adversity does not have a singular definition, it is a general concept that can relate to how bad a situation is, how many types of adversity one is exposed to, how long the adversity lasts, and how old one is at the time of exposure, among others. Each questionnaire used in the studies provides a spectrum of how severe the adversity was that each child experienced. A common finding across all studies was that the degree of change in the neural circuitry correlated with the severity of adversity. In most tracts, more severe adversity caused more changes in the brain.[29,32,34,35,37,44] One effect of this is that the age of onset of psychiatric illness correlates with CA severity. For example, both more severe adversity and longer duration of adversity is associated with an earlier age of onset in bipolar disorder.[31] Another finding is that more severe adversity correlates with more severe presentation of a disorder, should it manifest. Increasing severity of adversity increased the severity of borderline personality disorder,[37] and increased severity of externalizing symptomatology.[43] It should also be noted that increasing severity of adversity positively correlates with both volumetric[10] and activity[12] changes in the brain.

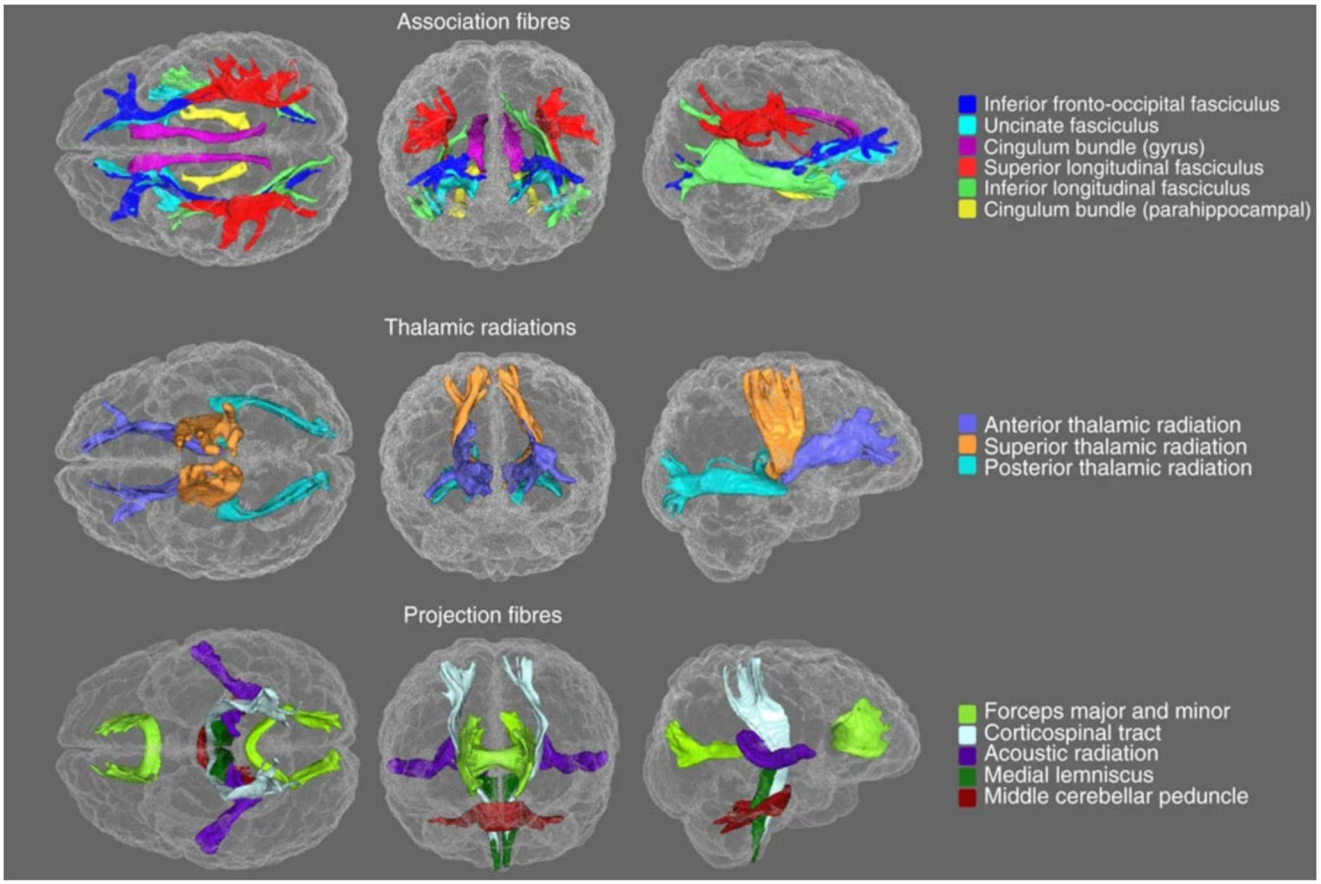
Discussion

Considering the results from the DTI studies, it appears that any adversity in childhood can cause a reduction in myelination and reduced connectivity through all major projection, association, and commissural fiber tracts. Furthermore, it can be interpreted that alterations in most of these tracts can cause any disease and are non-specific, meaning that many different tract changes are associated with many different disorders. However, there are a few locations affected that may cause unique disorders. Therefore, it may be more clinically useful to understand connectivity between regions and their excitatory or inhibitory influences. For this reason, the results of the fMRI studies are more clinically useful as they allow the visualization of how one region exerts a response from another region. Clinically, it is also more useful to look at subjects who developed a disorder rather than those who remain healthy. That is to say, understanding the changes in each particular disorder is more important than just understanding changes that do not lead to a disorder.

Clinical Application

It is known that people exposed to CA are at higher risk for developing a psychiatric disorder,[7] and as mentioned previously, brain changes are positively correlated with increasing severity of adversity. Thus, knowing the severity of adversity that was experienced in childhood may help with preventive medicine. Primary care clinicians should be

Figure 2. White Matter Tracts



Legend: "White Matter Tracts of Interest" by Cox et al. 2016 is licensed under https://creativecommons.org/licenses/by/4.0/

cognizant of patients who had difficult childhoods and monitor them for development of psychiatric disorder and try to detect early onset. Therefore, in the future it might be an option to recommend that if a patient has a certain number of adverse events (i.e. threshold), they should be monitored more closely for early detection of possible development of psychiatric disorder. Perhaps it should be recommended that new patients take a standardized questionnaire about their childhood experiences.

There is some evidence that the specific type of adversity experienced affects specific regions in the brain involved in those experiences.[46] However, there is not a complete data set that indicates exactly what changes are a result of what type of adversity, nor whether there is statistically significant association. Therefore, although research is getting closer, two questions of importance remain unanswered: (1) do certain types of adversity cause certain brain changes? (2) do specific brain changes lead to specific disorders?

If (1) and (2) are both true, then identifying the type of adversity would allow prediction of the type of disorder. This would be especially useful in practice, because it would not require looking at the brain directly to determine what disorder may develop. This provides yet another reason for possibly obtaining a questionnaire about childhood adversity to new patients.
If (1) is true but (2) is false, then it can just as appropriately be said that any type of adversity may cause any type of disorder. Apart from already knowing that there is increased risk for a disorder to possibly develop, this would not be especially useful in clinical practice.

If (1) is false but (2) is true, then identifying what change has occurred could allow prediction of what type of disorder might develop in patients with history of severe CA. However, this would require direct visualization of the brain. Therefore, another potential monitor of at-risk patients could be an MRI scan if a threshold number of adverse events has been reached. This would allow for detection of which pathway changes have occurred and therefore narrow the field of potential psychiatric disorders for which they are at risk of developing. Again, this would only be useful if it is determined that certain changes are indeed linked with certain disease states. However, considering the current cost of MRI and cost of care, a thorough cost analysis would need to be performed; this is outside the scope of this paper. A brief look at the cost of care for individuals with history of childhood adversity may be useful. For victims surviving child maltreatment, the associated lifetime medical costs are estimated to be approximately $43,000.[47] For child maltreatment resulting in death, the associated lifetime medical costs are approximately $14,000. In 2008, the estimated total lifetime economic burden of childhood maltreatment in the United States was $124 billion and possibly up to $585 billion.[47]

Future directions

Possibly the most pertinent question for the future is to determine whether the changes in these children can be prevented entirely, halted, or reversed. More specifically, if children are raised in less adverse environments, or receive treatment (i.e., counseling), can their neural development be unhindered? We should be asking if and how clinicians can assist these children in order to prevent these brain changes. As expected, research is moving in this direction. The study by Wymbs et al. 2020 looked at the effect of how positive support in children exposed to adversity leads to neural changes.[48] They found that children who had more positive social support had less of an increase in activity within regions known to be hyperactive in children exposed to adversity.[48] This shows that positive support results in less change than expected in children with the same amount of adversity but no positive support. This study is the first to attempt to answer the question of how positive social support affects the neural circuitry of children who had been exposed to adversity. While this study is not the focus of this review, it offers an understanding of the direction in which research will progress and how this knowledge may be applied clinically. This study did not look at connectivity between regions, but rather looked at activity in singular regions.

Other directions for future research include addressing questions such as if clinicians are aware of children experiencing adversity, can that affect the outcome of these children? If primary care physicians were aware of which children experience adversity, would it change how they treat these children? A final question to pursue is to determine which, if any, pathways have not yet been imaged, and obtain information regarding them.

Alternative Perspectives

Alternative reasons for these neural changes as a result of CA must be considered. It is possible that these changes are beneficial, not detrimental as many people suggest. When we assume that life is not perfect and all children experience some sort of adversity, then it follows that it should be developmentally important to learn to cope with problems in life, both consciously and unconsciously. Therefore, these neural changes could be adaptive mechanisms to help the individual. This hypothesis is difficult to answer because we have no way to study a control group who have a life without conflict. However, it remains possible that these changes help individuals cope with the world around them and leave them better equipped to handle adversity throughout life.

However, if these changes are beneficial, they do not explain why individuals exposed to CA are more likely to develop psychiatric disorder. Or perhaps because there is already an increased risk of developing a psychiatric disorder, it does not offset the possibility that these neural alterations leave these children better able to deal with their world. In other words, if individuals exposed to childhood adversity are able to maintain normal function, these changes might be beneficial.

Limitations

One limitation of the studies is related to the composition of study groups. Appropriately each of the studies discussed used childhood adversity (CA) as their group of interest. Control groups had different compositions; sometimes the control was no adversity, other times it was no psychiatric disorder present. In other words, some studies looked at CA vs. no CA, while other studies looked at CA with disorder vs. CA without disorder. The former helps identify changes in everyone exposed to CA but limits insight into clinical outcomes. The latter provides useful information about changes specific to resulting clinical disorders, however there is no completely healthy control group which is a limiting factor.

An additional limitation is that current research suggests most connectivity changes are not specific to any psychiatric disease. In other words, no singular changes have yet been confirmed as a direct link to any specific disease. Also related to this is the limitation of the DTI studies. While they are imperative to understanding and advancing the field, they appear to demonstrate mostly decreased connectivity throughout most of the white matter tracts, and thus do not provide specific changes related to specific disease states.

The final limitation is this review itself. This narrative review helps understand the current stage of research and addresses future directions and possible clinical applications; however, it has a limited comprehensive results analysis. A systematic review would yield more comprehensive data with comparison of results and would also help to identify any bias or random errors.

Conclusion

The more adversity a child experiences, the more likely they are to have negative long-term consequences, such as earlier onset and more severe symptoms of a psychiatric disorder. The underlying mechanism causing these disorders from CA is relatively unknown. Recent research

has attempted to answer these questions by mapping functional connectivity throughout the brain. There are many different types of changes in the brain, including alterations in structure, regional activity, circuitry, and functional connectivity. These were thought to be permanent, but the most recent research has begun to demonstrate that they can be attenuated. [48]

Clinically, it is important to understand these effects and changes in order to potentially and proactively help these children. Clinicians should be aware that an increasing severity of childhood adversity increases the risk for developing psychiatric disorder. We may be able to identify the development of psychiatric illness earlier and treat it sooner as we continue to increase our understanding of neurological changes. If this can be accomplished, we may also be able to decrease hospitalizations due to mental illness and therefore decrease the overall cost of care while treating more effectively.

Learning more about the details of neurological change will help clinicians take better care of their patients. Because childhood adversity increases the risk for both medical disease and psychiatric illness,[7,9] primary care practitioners should be on the lookout for development of these disorders. If clinicians are aware that a patient has had severe childhood adversity, they can also be aware of the risk for psychiatric illness and possibly identify the onset earlier. But more importantly, simply having a basic understanding of a patient's childhood experiences could allow for more comprehensive and compassionate care. As we expand this field of knowledge, perhaps new recommendations for primary care practitioners will be implemented. One idea could be to implement a childhood adversity questionnaire for patients in the primary care setting.

References

1. Ujhelyi Nagy A, Kuritár Szabó I, Hann E, Kósa K. Measuring the Prevalence of Adverse Childhood Experiences by Survey Research Methods. International Journal of Environmental Research and Public Health. 2019 Jan;16(6):1048.
2. Soares ALG, Howe LD, Matijasevich A, Wehrmeister FC, Menezes AMB, Gonçalves H. Adverse childhood experiences: Prevalence and related factors in adolescents of a Brazilian birth cohort. Child Abuse Negl. 2016 Jan;51:21–30.
3. Maunder RG, Peladeau N, Savage D, Lancee WJ. The prevalence of childhood adversity among healthcare workers and its relationship to adult life events, distress and impairment. Child Abuse Negl. 2010 Feb;34(2):114–23.
4. Merrick MT, Ford DC, Ports KA, Guinn AS. Prevalence of Adverse Childhood Experiences From the 2011-2014 Behavioral Risk Factor Surveillance System in 23 States. JAMA Pediatr. 2018 Nov;172(11):1038–44.
5. Bürgin D, Boonmann C, Schmid M, Tripp P, O'Donovan A. Fact or artefact? Childhood adversity and adulthood trauma in the U.S. population-based Health and Retirement Study. Eur J Psychotraumatol. 2020 Feb 14;11(1).
6. Merikangas KR, He J, Burstein M, Swanson SA, Avenevoli S, Cui L, et al. Lifetime Prevalence of Mental Disorders in US Adolescents: Results from the National Comorbidity Study-Adolescent Supplement (NCS-A). J Am Acad Child Adolesc Psychiatry. 2010 Oct;49(10):980–9.
7. Norman RE, Byambaa M, De R, Butchart A, Scott J, Vos T. The Long-Term Health Consequences of Child Physical Abuse, Emotional Abuse, and Neglect: A Systematic Review and Meta-Analysis. PLoS Med. 2012 Nov 27;9(11).
8. Widom CS, DuMont K, Czaja SJ. A prospective investigation of major depressive disorder and comorbidity in abused and neglected children grown up. Arch Gen Psychiatry. 2007 Jan;64(1):49–56.
9. Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, Edwards V, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. Am J Prev Med. 1998 May;14(4):245–58.
10. Hart H, Rubia K. Neuroimaging of child abuse: a critical review. Front Hum Neurosci. 2012;6:52.
11. Calem M, Bromis K, McGuire P, Morgan C, Kempton MJ. Meta-analysis of associations between childhood adversity and hippocampus and amygdala volume in non-clinical and general population samples. Neuroimage Clin. 2017;14:471–9.
12. Hein TC, Monk CS. Research Review: Neural response to threat in children, adolescents, and adults after child maltreatment - a quantitative meta-analysis. J Child Psychol Psychiatry. 2017;58(3):222–30.
13. Huffhines L, Noser A, Patton SR. The Link Between Adverse Childhood Experiences and Diabetes. Curr Diab Rep. 2016 Jun;16(6):54.
14. Anderson EL, Fraser A, Caleyachetty R, Hardy R, Lawlor DA, Howe LD. Associations of adversity in childhood and risk factors for cardiovascular disease in mid-adulthood. Child Abuse Negl. 2018 Feb;76:138–48.
15. Traub F, Boynton-Jarrett R. Modifiable Resilience Factors to Childhood Adversity for Clinical Pediatric Practice. Pediatrics. 2017 May 1;139(5).
16. Dienes KA, Hammen C, Henry RM, Cohen AN, Daley SE. The stress sensitization hypothesis: understanding the course of bipolar disorder. J Affect Disord. 2006 Oct;95(1–3):43–9.
17. Bernstein DP, Ahluvalia T, Pogge D, Handelsman L. Validity of the Childhood Trauma Questionnaire in an Adolescent Psychiatric Population. Journal of the American Academy of Child & Adolescent Psychiatry. 1997 Mar 1;36(3):340–8.
18. Cohen RA, Hitsman BL, Paul RH, McCaffery J, Stroud L, Sweet L, et al. Early Life Stress and Adult Emotional Experience: An International Perspective. Int J Psychiatry Med. 2006 Mar 1;36(1):35–52.
19. Williamson DE, Birmaher B, Ryan ND, Shiffrin TP, Lusky JA, Protopapa J, et al. The Stressful Life Events Schedule for children and adolescents: development and validation. Psychiatry Research. 2003 Aug 1;119(3):225–41.
20. Taylor SE, Eisenberger NI, Saxbe D, Lehman BJ, Lieberman MD. Neural Responses to Emotional Stimuli Are Associated with Childhood Family Stress. Biological Psychiatry. 2006 Aug 1;60(3):296–301.
21. Teicher MH, Samson JA, Polcari A, McGreenery CE. Sticks, Stones, and Hurtful Words: Relative Effects of Various Forms of Childhood Maltreatment. Am J Psychiatry. 2006;8.
22. Angold A, Prendergast M, Cox A, Harrington R, Simonoff E, Rutter M. The Child and Adolescent Psychiatric Assessment (CAPA). Psychological Medicine. 1995 Jul;25(4):739–53.
23. Holbrook, H., O'Loughlin, K., Althoff, R., Douglas-Palumberi, H., Kaufman, J., & Hudziak, J. The Yale-Vermont adversity in childhood scale: A quantitative approach to adversity assessment. Paper Presented at the American Academy of Child and Adolescent Psychiatry's 61st Annual Meeting. 2015.
24. Feldman HM, Yeatman JD, Lee ES, Barde LHF, Gaman-Bean S. Diffusion tensor imaging: a review for pediatric researchers and clinicians. J Dev Behav Pediatr. 2010 May;31(4):346–56.
25. Chen K, Azeez A, Chen DY, Biswal BB. Resting-State Functional Connectivity: Signal Origins and Analytic Methods. Neuroimaging Clin N Am. 2020 Feb;30(1):15–23.
26. Song S-K, Sun S-W, Ramsbottom MJ, Chang C, Russell J, Cross AH. Dysmyelination Revealed through MRI as Increased Radial (but Unchanged Axial) Diffusion of Water. NeuroImage. 2002 Nov 1;17(3):1429–36.
27. Duarte JA, de Araújo E Silva JQ, Goldani AA, Massuda R, Gama CS. Neurobiological underpinnings of bipolar disorder focusing on findings of diffusion tensor imaging: a systematic review. Braz J Psychiatry. 2016 Mar 22;38(2):167–75.

28. Choi J, Jeong B, Rohan ML, Polcari AM, Teicher MH. Preliminary evidence for white matter tract abnormalities in young adults exposed to parental verbal abuse. Biol Psychiatry. 2009 Feb 1;65(3):227–34.

29. Choi J, Jeong B, Polcari A, Rohan ML, Teicher MH. Reduced fractional anisotropy in the visual limbic pathway of young adults witnessing domestic violence in childhood. Neuroimage. 2012 Jan 16;59(2):1071–9.

30. Huang H, Gundapuneedi T, Rao U. White Matter Disruptions in Adolescents Exposed to Childhood Maltreatment and Vulnerability to Psychopathology. Neuropsychopharmacology. 2012 Nov;37(12):2693–701.

31. Benedetti F, Bollettini I, Radaelli D, Poletti S, Locatelli C, Falini A, et al. Adverse childhood experiences influence white matter microstructure in patients with bipolar disorder. Psychol Med. 2014 Oct;44(14):3069–82.

32. Poletti S, Aggio V, Brioschi S, Bollettini I, Falini A, Colombo C, et al. Impact of early and recent stress on white matter microstructure in major depressive disorder. J Affect Disord. 2018 01;225:289–97.

33. Graziano RC, Bruce SE, Paul RH, Korgaonkar MS, Williams LM. The effects of bullying in depression on white matter integrity. Behav Brain Res. 2019 02;363:149–54.

34. Poletti S, Mazza E, Bollettini I, Locatelli C, Cavallaro R, Smeraldi E, et al. Adverse childhood experiences influence white matter microstructure in patients with schizophrenia. Psychiatry Res. 2015 Oct 30;234(1):35–43.

35. Kim MJ, Elliott ML, d'Arbeloff TC, Knodt AR, Radtke SR, Brigidi BD, et al. Microstructural integrity of white matter moderates an association between childhood adversity and adult trait anger. Aggress Behav. 2019;45(3):310–8.

36. Smitha KA, Akhil Raja K, Arun KM, Rajesh PG, Thomas B, Kapilamoorthy TR, et al. Resting state fMRI: A review on methods in resting state connectivity analysis and resting state networks. Neuroradiol J. 2017 Aug;30(4):305–17.

37. Vai B, Sforzini L, Visintini R, Riberto M, Bulgarelli C, Ghiglino D, et al. Corticolimbic Connectivity Mediates the Relationship between Adverse Childhood Experiences and Symptom Severity in Borderline Personality Disorder. Neuropsychobiology. 2017;76(2):105–15.

38. Barch D, Pagliaccio D, Belden A, Harms MP, Gaffrey M, Sylvester C, et al. Hippocampal and Amygdala Connectivity Mediate The Relationship Between Preschool Poverty and School Aged Depression. Am J Psychiatry. 2016 Jun 1;173(6):625–34.

39. Hanford LC, Eckstrand K, Manelis A, Hafeman DM, Merranko J, Ladouceur CD, et al. The impact of familial risk and early life adversity on emotion and reward processing networks in youth at-risk for bipolar disorder. PLoS ONE. 2019;14(12):e0226135.

40. Zielinski MJ, Privratsky AA, Smitherman S, Kilts CD, Herringa RJ, Cisler JM. Does development moderate the effect of early life assaultive violence on resting-state networks? An exploratory study. Psychiatry Res Neuroimaging. 2018 30;281:69–77.

41. Kim MJ, Scult MA, Knodt AR, Radtke SR, d'Arbeloff TC, Brigidi BD, et al. A Link Between Childhood Adversity and Trait Anger Reflects Relative Activity of the Amygdala and Dorsolateral Prefrontal Cortex. Biol Psychiatry Cogn Neurosci Neuroimaging. 2018;3(7):644–9.

42. Hanson JL, Knodt AR, Brigidi BD, Hariri AR. Heightened connectivity between the ventral striatum and medial prefrontal cortex as a biomarker for stress-related psychopathology: understanding interactive effects of early and more recent stress. Psychol Med. 2018;48(11):1835–43.

43. Barch DM, Belden AC, Tillman R, Whalen D, Luby JL. Early Childhood Adverse Experiences, Inferior Frontal Gyrus Connectivity, and the Trajectory of Externalizing Psychopathology. J Am Acad Child Adolesc Psychiatry. 2018;57(3):183–90.

44. Peverill M, Sheridan MA, Busso DS, McLaughlin KA. Atypical Prefrontal-Amygdala Circuitry Following Childhood Exposure to Abuse: Links With Adolescent Psychopathology. Child Maltreat. 2019;24(4):411–23.

45. Cox SR, Ritchie SJ, Tucker-Drob EM, Liewald DC, Hagenaars SP, Davies G, et al. Ageing and brain white matter structure in 3,513 UK Biobank participants. Nature Communications. 2016 Dec 15;7(1):13629.

46. Teicher MH, Samson JA. Annual Research Review: Enduring neurobiological effects of childhood abuse and neglect. J Child Psychol Psychiatry. 2016 Mar;57(3):241–66.

47. Fang X, Brown DS, Florence CS, Mercy JA. The economic burden of child maltreatment in the United States and implications for prevention. Child Abuse Negl. 2012 Feb;36(2):156–65.

48. Wymbs NF, Orr C, Albaugh MD, Althoff RR, O'Loughlin K, Holbrook H, et al. Social supports moderate the effects of child adversity on neural correlates of threat processing. Child Abuse Negl. 2020 Apr;102:104413.

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Case Report

8-Year-Old Child with Cerebral Palsy Treated with Pelvic Osteotomies Using 3.5 mm Blade Plate Having Subsequent Bilateral Implant Aseptic Loosening: A Case Report

Ahmed Nahian,[1] Julieanne P. Sees.[2]

Abstract

Background: Cerebral palsy (CP) is a central problem of the brain due to neurological insult that affects muscle posture, tone, and movement, resulting in poor motor control and dysfunctional muscle balance affecting hip joints in the growing child. Surgical treatment of hip and, if present, acetabular dysplasia addresses the femoral neck-shaft angle, appropriate muscle lengthening, and deficiency of acetabular coverage, as necessary. The surgeons perform proximal femoral osteotomies (PFOs) mostly with fixed angled blade plates (ABP) with proven success. The technique using an ABP is common and requires detailed attention to perform and to teach. **The Case:** In this case, an eight-year-old ambulatory patient with CP underwent bilateral proximal varus femoral derotational and pelvic osteotomies for the neuromuscular hip condition with a 3.5 mm Locking Cannulated Blade System (OP-LCP) by OrthoPediatrics Corp instead of the use of the conventional 4.5 mm ABP procedure, resulting in aseptic loosening. **Conclusion:** Due to the child's underdeveloped posture, the surgeon utilized the 3.5 mm instrumentation for a child-size implant, which worked sufficiently for the surgery but may not have loosened if a similar child-size blade plate system of 4.5 mm screws was implanted. While the ABP and OP-LCP systems are effective and safe for internal corrections of PFOs, the OP-LCP system may aid the residents in learning the procedure with higher confidence, fewer technical inaccuracies, and refined outcomes. Both systems are safer and viable for the treatment of neuromuscular hip conditions.

Key Words: Cerebral Palsy; Hip Dislocation; Osteotomy; Gait; Acetabuloplasty; Bone Anteversion (Source: MeSH-NLM).

Introduction

Cerebral palsy (CP) is a central problem of the brain due to neurological insult that affects muscle posture, tone, and movement, causing poor motor control and affecting the extremities, particularly the forces of the hip joint. In a review of children with the hip disease across all Centers for Disease Control and Prevention (CDC) sites, researchers found that 3.1 prevalence per 1,000 children were born with CP.[1] Children with CP are prone to develop hip dysplasia. Often confused with congenital dysplasia of the hip (CDH), children with CP-led hip dysplasia have different development pathways. Clinical diagnosis of CDH is carried with findings of a lax dislocated hip at birth, tighter displaying hip at six weeks postpartum, or an abnormal gait at 15 weeks postpartum. Common symptoms of CDH include asymmetrical or abducted legs along with a limited range of motion in squatting, walking, and crawling positions.[2,3] In patients with CP, the hip is usually normal at birth, but the hampered motor development leads to dysplasia. Gross Motor Function Classification System (GMFCS) tracks movements like walking, sitting, and mobile device usage to deliver a lucid description of a child's updated motor function and a concept of what mobility aid a child may require, e.g., walking frames, crutches, and wheelchairs. The rate of hip displacement in children with CP has been demonstrated as a linear relationship with the child's GMFCS level.[4]

Surgical correction of hip dysplasia commonly involves addressing the femoral neck-shaft angle, appropriate muscle lengthening, and addressing acetabular coverage deficiency as necessary.[5,6] Proximal femoral osteotomies (PFOs) are mostly performed with fixed angled blade plates (ABP) with proven success, while instrumentation of proximal femoral locking plate systems is often sufficient. The osteotomy technique using an ABP, however, is complex to perform and to teach.[6] In this case, we present an eight-year-old patient with CP who underwent bilateral hip varus femoral derotational and pelvic osteotomies for hip dysplasia with a 3.5 mm Locking Cannulated Blade System (OP-LCP) by OrthoPediatrics Corp. The patient's smaller size dictated usage of the 3.5 mm LCP for that manufacturer, which would be comparable to more conventional 4.5 mm ABP such as other systems manufactured; thus, the nature of a less robust implant strength likely resulted in the aseptic loosening.

Highlights:

- Cerebral palsy (CP) is the most prevalent motor disability in childhood.
- Hip dysplasia, caused by CP, can be avoided by early screening, and fixed at a lower risk with procedural measures, i.e., osteotomies, on children with alarming hips.
- Though fruitful, the angled blade plate method of performing osteotomies is unnecessarily complex, while modern technology allows for more viable methods.

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The Case

An eight-year-old ambulatory male patient GMFC III was found to have an increasing hip subluxation and acetabular dysplasia despite continued progress with a posterior walker and a previous history at age five of bilateral hip adductor, iliopsoas, and gracilis muscles lengthening. In general, a pediatric patient of his age and GMFCS level has 27% success of not developing further hip subluxation after muscle lengthenings.[7] Upon radiographic (***Figure 1***) review, as confirmed on computed tomography scan, bilateral uncovering of the femoral heads with right acetabular dysplasia posteriorly was observed. As the patient was ambulatory, a 3D instrumented gait analysis was conducted demonstrating bilateral mild hip internal rotation, normal flexion/extension motion, and mild lurching secondary to bilateral abductor weakness and poor control (***Figure 2***).

With evidence of physical exam, radiographs, and 3D gait analysis, this child was sent to a pediatric neuromuscular-orthopedic surgeon, who performed bilateral hip femoral varus derotational osteotomies with right acetabuloplasty (***Figure 3***). Imaging and clinical findings dictated preoperative planning for PFOs. The patient was in the supine position during surgery; the patient's position and closure are the same in most PFOs. The 5 cm long incision was laterally originating at the tip of the greater trochanter. The femoral osteotomy goal was to provide a medially based closing wedge osteotomy. The aim was to improve the hip's centering by restoring the femoral neck and head by decreasing (varus) the femoral neck-shaft angle. Internal fixation commonly requires an ABP or the LCP (Locking Cannulated Blade System). LCP supplies primary strength by locking screws on a plate and deviation of femoral neck screws and involves guidewires. The guidewire for the blade plate chisel was inserted into the femoral neck along its axis. Since the varus correction was conducted at 30° with a 110° plate, the guidewire was placed by adjusting the instruments to 140°. After placing the child-size chisel, due to fluoroscopy, particularly in the lateral intraoperative view, the lateral femur was too small and unable to accommodate the adolescent 4.5 mm cannulated system. The medially based femoral wedge osteotomy was performed; the OP plate was then placed into the proximal fragment without difficulty, and the osteotomy was reduced, assuring bilateral symmetry of length and rotation, affixed to the femur. Final intraoperative radiography was satisfactory upon completing all procedures, including pelvic osteotomy of the right hip for adequate bilateral hip reconstruction.

Figure 1. Preoperative X-Ray Showing CP-Caused Hip Dysplasia in Supine Position. Anterior to Posterior (Front to Back) X-Ray Displaying Hip Dysplasia in the Right Hip (at the Orange Arrow). The Dotted Red Lines Show the Shortage of Acetabular Coverage in the Dysplastic Hip vs. the Healthy Hip.

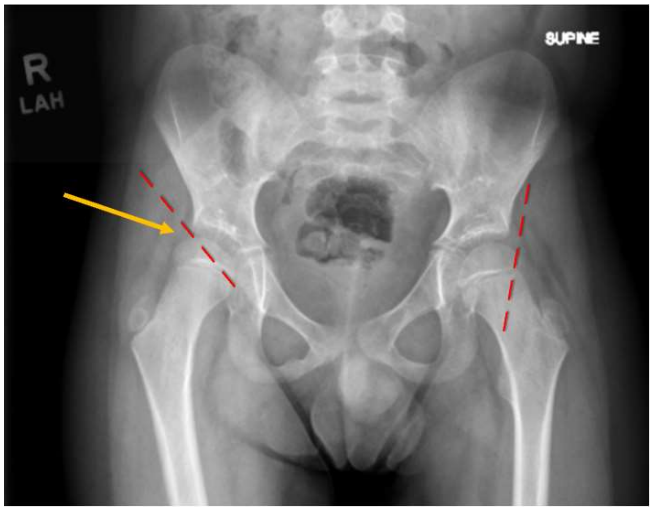

Figure 2. 3D Instrumented Gait Analysis of Hip Motion During Ambulation for an 8-Year-Old Boy GMFC III with CP. The Patient is Seen with Out-of-Range Motion Compared Against Normal Standard Deviations.

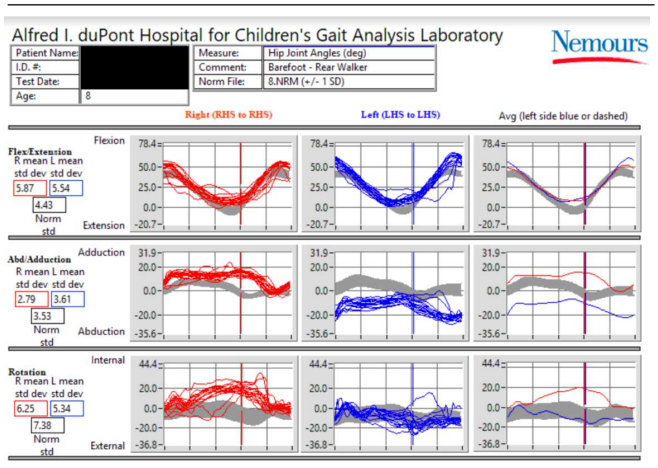

Figure 3. Immediate Postoperative X-Ray After Initial Hip Surgery. The Bones Have Been Spliced and Conjoined with LCP.

The patient tolerated the procedure and was admitted for a 6-week course of inpatient rehabilitation. His full weight-bearing status was tolerated immediately in postoperative conditions; after one year of the surgery, osteotomies were healed, and no complaints were reported with his ambulatory functional level maintained (***Figure 4***). Due to his young age at the time of implantation, the initial plan was to remove the implants at one year postoperative. At the one-year postoperative clinic visit, the parents were unclear if there were any painful symptoms from the hardware prominence due to the child's limited communicative ability. According to the patient's mother, in retrospect, he had a vague thigh pain as he would point anteriorly or laterally to his thighs intermittently after more extended periods of walking and upright activities. The family proceeded with outpatient surgical hardware removal at 18-months postoperative with intraoperative findings marked with significant trochanteric bursitis bilaterally and symmetric bilateral loosening of shaft screws (***Figure 5***). The child subsequently tolerated the hardware removal without any complications, returning to his previous functional level, pain-free.

Discussion

The treatment of hip contractures caused by cerebral palsy was first published in 1880.[8] A retrospective review indicates a lateral dislocation (partial) and subluxation of the hip existing in 30-60% of non-ambulatory

Figure 4. Radiograph at 18-Months in Postoperative, the Patient Displays Healed Osteotomies; The Distal Femoral Shaft Screws Are Backing Out Bilaterally.

Figure 5. Postoperative X-Ray After Implant Removal.

ambulatory pediatric CP patients aged five years.[9] The patient presented in this case was of GMFCS level III, thus using an assistive device for his ambulation. Being an ambulatory child with a gait abnormality, notable lurching, and a combination of poor motor control and along with movements of the iliotibial band abductor complex, the smaller nature of the 3.5 mm system over a 4.5 mm stronger plate setup may have led to mechanical implant loosening after femoral osteotomies healed.

The standard protocol is to determine the level of dislocation or subluxation of the hip joint using an anteroposterior radiograph, as used in this case, to measure hip migration percentage. While this case may not have involved many patients, the surgical and radiographic procedures were standard. The pelvic and hip positions during radiography were consistent with verifying the reliable change. In previous cases, the migration rate often indicated the level of risk—a 7% annual migration corresponded with a developing hip disability. A displacement between 33% and 80% indicates hip subluxation, and over 80% indicates hip dislocation. The interconnection between hip migration and migration percentage is relatively vague, and migration percentage is not uniformly indicative of a child's clinical and functional picture, which eventually plays a significant role in treatment plans. A bilateral check on hip integrity after an intervention is suggested; bilateral functionality and pain-free range of motion (ROM) have always acted as the benchmark for surgical success. In ambulatory children with notable symptoms of internally rotated gait secondary to internal rotation at the hip, the prodigal time for reconstruction is between 5 and 7 years.[10] The risk of establishing recurrent bony anteversion is much lower around that age range; furthermore, motor control, planning, and balance start to reach their peak at this range. This peak allows for full restoration of function by formal elementary education, crucial to middle childhood.[10]

While CP and hip deformity are commonly treated conditions, the surgeon utilized a relatively newer but proven effective surgical hip fixation method. Dating back to the time of Hippocrates, osteotomies are generally performed for two reasons: to precisely realign a bone's axis or to allow bone transport.[11] As used in this case, a simple osteotomy may fix rotational or angular defects by which healing is in compression. This procedure solely depends on stability to encourage union in the postoperative position. As mentioned earlier, PFOs are mostly performed with fixed angled blade plates (ABP) due to proven success rate and lower cost. Despite its positive results, ABP is technically challenging for those accustomed to the implant and requires experienced attention. In this patient's case, the surgeon utilized the 3.5 mm instrumentation for a child-size implant, which worked sufficiently for the surgery but may not have loosened if a similar child-size blade plate system of 4.5 mm screws was implanted. OP-LCPs are relatively more expensive than ABPs; however, LCPs are better for steadiness, angle correction, and in training institutions in treatment of neurological hip disorders, such as CP.[12] Based on the results of this case, we conclude that both the ABP and OP-LCP systems are fruitful and safe for internal corrections of PFOs (***Table 1***). Additionally, the OP-LCP system may aid the residents in learning the procedure with higher confidence, fewer technical inaccuracies, and refined outcomes; this case brings caution to using this system in all hip deformities of ambulatory children. OP-LCP is exclusively targeted for the surgical correction of pediatric hip deformity, fixed knee flexion deformity, and trauma. The system acts as a primary exposure to osteotomies for trainees via easy-to-use locking screws in the proximal and distal fragments. OP-LCP employs various offsets to restore the mechanical axis of the lower limb, allowing the surgeons to use unique methodology but produce reproducible results. Finally, the implant removal difficulty level must be cautiously reviewed when selecting a method of performing pediatric PFOs. Removal of all blade plates requires attention, knowing there is a high prevalence of fractures and retained hardware in children with CP.[13] The removal of the OP-LCP, in this case, was safely performed and extracted without morbidity, which is supported by previous literature.

Table 1. Procedural Comparison Between ABP and OP-LCP Methods.

Step	ABP	OP-LCP
Guidewire insertion	approximated to line of the seating chisel	precise to line of the seating chisel
Chisel insertion	below guidewire, which serves only as a reference plane	directly over the wire
Implant insertion	approximate and adjustable	plannable, predictable, and precise

References

1. Centers for Disease Control and Prevention. Data and Statistics for Cerebral Palsy. Available from: https://www.cdc.gov/ncbddd/cp/data.html. Last updated Apr 30, 2019; cited Aug 4, 2020.
2. International Hip Dysplasia Institute. Developmental Dysplasia of the Hip (DDH). Available from: https://hipdysplasia.org/developmental-dysplasia-of-the-hip/. Last updated Jul 4, 2020; cited Aug 4, 2020.
3. International Hip Dysplasia Institute. FAQ #4 What Are Some Signs I Can Look for if I Suspect I Have Hip Dysplasia? Available from: https://hipdysplasia.org/developmental-dysplasia-of-the-hip/faq/#:~:text=Hip%20dysplasia%20that%20needs%20treatment,common%20in%20girls%20than%20boys. Last updated Jul 4, 2020; cited Aug 4, 2020.
4. Soo B, Howard JJ, Boyd RN, Reid SM, Lanigan A, Wolfe R, et al. Hip displacement in cerebral palsy. J Bone Joint Surg Am. 2006 Jan;88(1):121-9.
5. Dyson PH, Lynskey TG, Catterall A. Congenital hip dysplasia: problems in the diagnosis and management in the first year of life. J Pediatr Orthop. 1987 Oct;7(5):568-74.
6. Miller, F. Cerebral palsy. 1st ed. New York: Springer-Verlag; 2005.
7. L. Zhou, M. Camp, A. Gahukamble, K. L. Willoughby, M. Harambasic, C. Molesworth, et al. Proximal femoral osteotomy in children with cerebral palsy: the perspective of the trainee. J Child Orthop. 2017 Jan;11(1):6-14.
8. Reimers J. The stability of the hip in children. A radiological study of the results of muscle surgery in cerebral palsy. Acta Orthop Scand Suppl. 1980 Dec;51Suppl184:S1-100.
9. Shore B, Spence D, Graham H. The role for hip surveillance in children with cerebral palsy. Curr Rev Musculoskelet Med. 2012 Jun;5(2):126-34.
10. Kazemi SM, Minaei R, Safdari F, Keipourfard A, Forghani R, Mirzapourshafiei A. Supracondylar Osteotomy in Valgus Knee: Angle Blade Plate Versus Locking Compression Plate. Arch Bone Jt Surg. 2016 Jan;4(1):29-34.
11. Dabis J, Templeton-Ward O, Lacey AE, Narayan B, & Trompeter A (2017). The history, evolution and basic science of osteotomy techniques. Strategies in trauma and limb reconstruction. 2017 Oct 06;12(3):169-80.
12. Khouri N, Khalife R, Desailly E, Thevenin-Lemoine C, Damsin JP. Proximal femoral osteotomy in neurologic pediatric hips using the Locking Compression Plate. J Pediatr Orthop. 2010 Dec;30(8):825-31.
13. Pountney T, Green EM. Hip dislocation in cerebral palsy. BMJ. 2006 Mar 30;332(7544):772-5.

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IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Experience

Combatting Misinformation During the COVID-19 Pandemic Via Social Media

Shehrbano Ali,[1] Muhammad Murad Murtaza.[1]

The Experience

The spread of misinformation has been prevalent in the world for quite a while now and it has been hypothesized that the widespread access to the internet can lead to digital wildfires of misinformation.[1] Such "wildfires" have also been seen to affect the healthcare sector worldwide; prominent examples of that being anti-vaxxers[2] who reject vaccinations based on misinformation pertaining to their side effects, cancer stigma leading to decreased cancer screening,[3] and alternative medicine approaches for chronic illnesses like diabetes.[4] Misinformation has been especially problematic during the COVID-19 pandemic. Due to the circulation of false and incomplete news and theories all over different social media platforms, extremes of opinions have developed among the population, with one end of the spectrum denying the very existence of a pandemic, and the other end being so fearful of the disease that they take extreme measures, such as suicide,[5] excessive self-administration of unprescribed medication,[6] or non-medical approaches like visiting the church despite being contagious.[7]

Amidst this havoc caused by COVID-19 related misinformation, students and doctors worldwide have used a variety of techniques to raise awareness regarding the different aspects of the pandemic and combatting misinformation pertaining to it.[8] The Combined Military Hospital (CMH) Arts and Design Society at the CMH Lahore Medical College took the initiative of tackling it via the same means as it was spread- via social media. This society has a history of addressing current affair issues pertaining to different aspects of health via panel discussions with renowned professionals and engaging students in multiple arts, photography, and video making competitions to raise awareness. In lieu of the pandemic, the members of the society recruited a group of twenty-four volunteers who were led by the authors of this experience as their supervisors. The volunteers were all medical students who were recruited based on their previous contributions to the society, as well as their performance in interviews that gauged their enthusiasm to participate in the project, their ability to understand medical literature, and their ability to submit a sample video or poster related to COVID-19. Then, we established social media pages by the name "Pakistan Corona Virus Research Outlook" on both Facebook and Instagram[9-10] (Figure 1) and used these platforms to spread valid and well-researched information regarding the disease among the general population. This was done by going through the new studies on COVID-19 that were published in PubMed indexed medical journals, and then presenting the data from these studies in the form of short animated videos or posters, which could be easily understood by people who did not have medical background or basic understanding of medical terminologies. The selection of these studies was done via literature review of articles present on PubMed by the volunteers, which were then screened by the supervisors and a team of CMH Lahore Medical College alumni who are registered doctors with the Pakistan Medical Council and currently working as post graduate trainees belonging to a range of specialties, particularly internal medicine. The screening by these alumni depended upon the impact factor of the journal that had published the article in question and the acceptability of the data presented in the articles based on their clinical knowledge. These videos and posters covered a range of topics, including but not limited to the epidemiology, clinical presentation, prevention, and possible therapeutic solutions for the coronavirus.[11-13] We created our social media pages in March 2020, and over a period of six months managed to gain a following of over 14,000 people (last checked: March 2021).

Figure 1. Cover picture of the Pakistan Corona Virus Research Outlook page on Facebook.

In order to further aid our incentive of providing authentic COVID-19 related information to the public, we also created a Facebook group named "Corona Virus (COVID-19) Free Counselling",[14] which was also associated with our Research Outlook page. This group served the purpose of providing basic information regarding prevention and management of the virus in layman terms, so that the people could be well-equipped with managing mild symptoms themselves at home, without panicking unnecessarily or burdening the healthcare system which is already stretched too thin. We achieved this by drafting an online handbook[15] that provided the relevant information.

Likewise, members who joined our Counselling group were also encouraged to post any queries they might have pertaining to the disease, which were then answered by senior members of the CMH Arts and Design Society and CMH Lahore Medical College Alumni who had also contributed to screening the articles for the Pakistan Corona Virus Research Outlook. The group has over one thousand members by March 2021.

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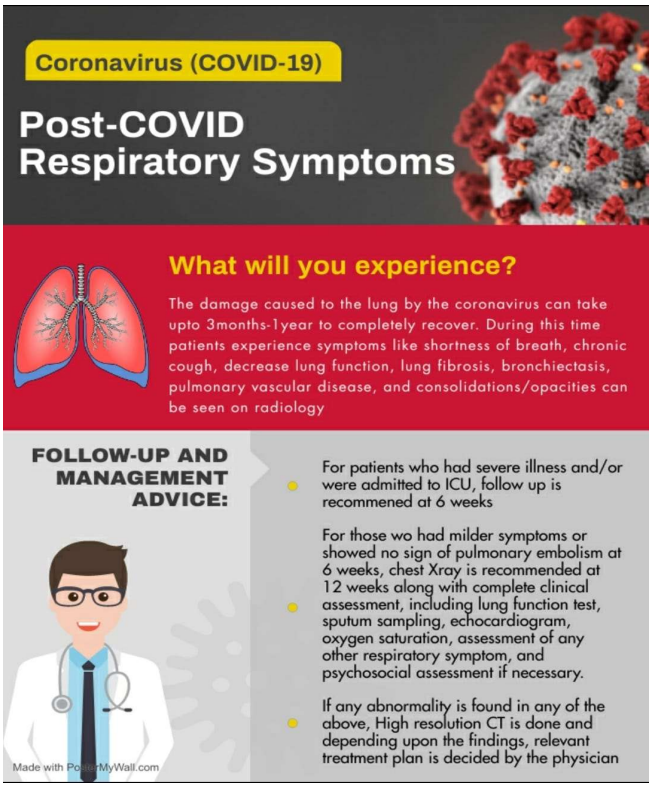
Figure 2. "Post-COVID Hair loss" Poster made by author Muhammad Murad Murtaza.

Figure 3. "Post-COVID Respiratory symptoms" Poster made by author Shehrbano Ali.



With time, we observed that there was an increasing number of queries and concerns regarding post-COVID symptoms by members of the group. In order to address this issue, we decided to start a series on post-COVID syndrome.[16] As part of this series, we made individual posters regarding the different symptoms experienced by patients even after recovering from the viral infection. These posters addressed concerns regarding the symptoms that may occur, as well as the follow up and management recommended for each of these based on research and published guidelines by experts.[17] Examples of these posters include those regarding post-COVID hair loss as seen in Figure 2 and post-COVID respiratory symptoms (Figure 3). These posters presented the information in an easily comprehensible way, providing the public with a set of guidelines to follow in the case of appearance of any of the post-COVID symptoms, without panicking and believing false information that may be found elsewhere on the internet and may misguide them regarding the course of action they should adopt.

As members belonging to the medical field, we feel it is our responsibility to ensure that the public does not fall prey to misinformation on social media, that could ultimately cause more panic, worsen the already sensitive situation, and increase the burden on the frontline medical workers. Through the aforementioned avenues on social media, we aimed to dispense valid and authenticated information to the people, addressing the relevant and popular concerns. This way, the population could have access to the latest medical information, researched and proven by experts, and they could remain well informed avoiding falling prey to false data found elsewhere on the internet. We played our small part in attaining our goal and using social media to widen our reach. Everybody, especially medical professionals, have been sailing through unchartered territories during this pandemic. It falls upon all of us to help ease the burden of the doctors fighting this pandemic on the frontlines in any way we can, even if it is merely combatting false information on the internet.

References

1. World Economic Forum – Global Risks 2013 Eighth Edition [Internet]. Global Risks 2013. 2021. Available from: http://wef.ch/GJKqei. Cited February 8, 2021.
2. Wang Y, McKee M, Torbica A, Stuckler D. Systematic Literature Review on the Spread of Health-related Misinformation on Social Media. Soc Sci Med. 2019 Nov;240:112552.
3. Vrinten C, Gallagher A, Waller J, Marlow L. Cancer stigma and cancer screening attendance: a population based survey in England. BMC Cancer. 2019 Jun 11;19(1):566.
4. Leong A, Sanghera R, Jhajj J, Desai N, Jammu B, Makowsky M. Is YouTube Useful as a Source of Health Information for Adults With Type 2 Diabetes? A South Asian Perspective. Can J Diabetes. 2018 Aug;42(4):395-403.e4.
5. Wallen J, Gulland A, Newey S, Boycott-Owen M, Meaker M, Nuki P, et al. Coronavirus: Indian man 'died by suicide' after becoming convinced he was infected. The Telegraph. 2021. Available from: https://www.telegraph.co.uk/global-health/science-and-disease/coronavirus-indian-man-died-suicide-becoming-convinced-infected/. Cited February 8, 2021
6. Sadio A, Gbeasor-Komlanvi F, Konu R, Bakoubayi A, Tchankoni M, Bitty-Anderson A, et al. Assessment of self-medication practices in the context of the COVID-19 outbreak in Togo. BMC Public Health. 2021 Jan 6;21(1):58.
7. Kasulis K. 'Patient 31' and South Korea's sudden spike in coronavirus cases. Aljazeera.com. 2021. Available from: https://www.aljazeera.com/news/2020/03/31-south-korea-sudden-spike-coronavirus-cases-200303065953841.html?xif=. Cited February 8, 2021.
8. Thomas N. Utilizing Health Education and Promotion to Minimize the Impact of COVID-19. Int J Med Student. 2020 May-Ago;8(2):188-190.

9. Pakistan Corona Virus Research Outlook [Internet]. Facebook. 2021. Available from: https://www.facebook.com/coronaoutlookcmhlmc. Cited April 5, 2021.
10. Pakistan Coronavirus Research. Instagram. 2021. Available from: https://instagram.com/coronaoutlookcmhlmc?igshid=f797k2r479fr. Cited April 5, 2021.
11. Han H, Ma Q, Li C, Liu R, Zhao L, Wang W, et al. Profiling serum cytokines in COVID-19 patients reveals IL-6 and IL-10 are disease severity predictors. Emerging Microbes & Infections. 2020 Dec;9(1):1123-30.
12. Rothan H, Byrareddy S. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. J Autoimmun. 2020 May;109:102433.
13. Ortolani C, Pastorello E. Hydroxychloroquine and dexamethasone in COVID-19: who won and who lost? Clin Mol Allergy. 2020 Sep 9;18:17
14. Corona Virus (COVID-19) Free Counselling. Facebook.com. 2021. Available from: https://www.facebook.com/groups/621038562095545. Cited April 5, 2021.
15. COVID-19 patient friendly ebook [Internet]. Facebook; 2021. Available from: https://www.facebook.com/groups/621038562095545. Cited April 5, 2021.
16. Mardani M. Post COVID Syndrome. Archives of Clinical Infectious Diseases. 2020;15(2):e108819
17. Overview | COVID-19 rapid guideline: managing the long-term effects of COVID-19 | Guidance | NICE, Nice.org.uk. 2021. Available from: https://www.nice.org.uk/guidance/ng188. Cited April 5, 2021.

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ULS

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Experience

Speaking Medicine in the Silent Language: Experience with a Deaf Patient in Sri Lanka

Hettiarachchige D. P. Jayawardana.[1]

Experience

Among the differently able in society, most of the people with hearing impairment have a challenge for a very basic everyday requirement, which is verbal communication. To get through this barrier, many people in this group use sign language, which includes hand movements and body language. There are nearly 300 different versions of sign language among different communities worldwide.[1] Likewise, 9% of the total Sri Lankan population are deaf people and they use sign language with some regional variations.[2] Despite having these slight variations, the fundamentals of sign language are same everywhere. The need to use sign language varies from daily activities to public services, such as hospitals and other social gatherings.

Some months ago, I finished my orthopedic surgery appointment at the National Hospital of Sri Lanka. It was my first day of the orthopedic surgery appointment. As usual, I went to the ward in the morning. My patient was a 45-year-old Asian male. He was admitted to the ward for corrective surgery of his leg length discrepancy following a road traffic accident. He had a terrible fracture of his left leg 4-years ago, which was treated with a dynamic external fixator.

As usual, I started to interview the patient for history-taking. However, he wasn't talking to me. Instead, he used the movements of his hands which I could not understand. Then I realized that he was deaf. Therefore, I asked for an interpreter from the office. Unfortunately, there was no such service available in almost all hospitals in the country.[3] Hospital staff communicated with the patient through one of his family members, during the visiting hours. Therefore, I tried to communicate with him in a written language. Later, I realized that my strategy was not working. It didn't reveal the true story of the patient. So, I searched online to find a possible solution. "An Introduction to Sri Lankan Sign Language" by Rohana Special School was the best answer to help me with basic history-taking, performing a clinical examination, and discussing the plan of management up to some extent.[4] Also, I had to rely on his family members for further clarification of several clinical details. However, when I spoke to the patient with my hands, it was equally interesting, rewarding, and challenging.

During the interview which was conducted using sign language, he told me how the external fixator made his life terrible in the previous 4-years. Despite that, he further explained that he had faced lots of communication difficulties with the health care personnel whether a nurse, doctor, or minor staff as they could not communicate with sign language. As the interview went on, I realized that no matter what race or religion deaf people belonged to, they all faced similar problems in communication when seeking medical treatment in government and private hospitals. However, he preferred government hospitals due to free health service and the trust he had in government institutions. During the course of his illness, he had been treated in an ayurvedic facility. Unfortunately, there was neither a health care personnel nor an interpreter who knew sign language when providing healthcare services. Since sign language is more of an expression of ideas, he seemed to face difficulties in reading the grammatical application of written language in Sinhala.

After having a long talk with the doctors, nurses, and pharmacists in the ward, it was clear that they also faced difficulties with history taking, providing health education, and instructing on drug regimes. Therefore, most of the time they communicated through a family member who does not have a hearing impairment.

Despite being a small portion of our community, they still require medical attention just like the rest of the population. In Sri Lanka, there are several deaf schools, run by the government and local charity organizations. Deaf students are taught the general Sri Lankan public school curriculum ranging from Grade 1 to 11 in sign language.[5] This education system is far different from the general education system. Unfortunately, there are no opportunities for the general public to learn sign language in their school curriculum. However, along the line, several steps have been suggested to overcome this barrier. For instance, teaching lip reading with sign language for deaf children was one of those steps.[6] Moreover, another step was to develop a software-based prototype to translate Sri Lankan Sign language into the Sinhala language to bridge the communication gap between deaf and non-deaf communities.[7] Unfortunately, owing to the increased need for facilities, these have not yet been made possible in Sri Lanka. The most recent approach was to develop a Sinhala-to-Sinhala Sign Language translation software for deaf children.[8] This research project was carried out from 2014 to 2017 costing a sum of 2.5 million rupees.[9] When considering the cost-effectiveness of operating such a system in each government hospital in Sri Lanka, the government will have to spend an added cost to annual health care expenditure of 206,182 million rupees.[10] Therefore, implementing medical and nursing school curriculums to overcome this gap will be an effective way for a developing country like Sri Lanka. This can be achieved through lecture-based teaching preferably in the behavioral sciences stream, problem-based learning (PBL) with deaf patients, and encouraging elective experiences related to deaf culture.

Some weeks after, a colleague informed me of the patient's follow-up. My colleague continued to have the same communication difficulty. At that moment, he had to rely on the patient's family too. According to him, he was not sure about the reliability of the true feelings of the patient when the communication was through close family members.

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In conclusion, when a person with hearing impairment seeks medical care, communication plays a vital role in building a good doctor-patient relationship in order to provide a high-quality healthcare service. When considering the size of the Sri Lankan deaf population, there is a likely chance that we will come across these people at some point in our careers. In that context, learning the basics of sign language in order to take patient's history and carry out a basic clinical examination, followed by proper health education, becomes very important in delivering healthcare services effectively. For that purpose, I propose that teaching sign language through medical and nursing school curriculums is a cost-effective way to bridge this gap for a third-world country like Sri Lanka. Every step in learning the basic skills and techniques of using sign language is challenging, as it requires a lot of understanding, focus, and practice. The vocabulary can be further strengthened by practicing each word separately and putting everything together in a synchronized way in order to form sentences, and communicate effectively.

References

1. United Nations. Sign Languages Are for Everyone. Available from: https://www.un.org/en/observances/sign-languages-day. Last updated September 23, 2020; cited September 28, 2020.
2. Hear-it. High frequency of hearing disorders in Sri Lanka.Available from: https://www.hear-it.org/high-frequency-of-hearing-disorders-in-sri-lanka#:~:text=Nine%20percent%20of%20Sri%20Lankans,some%20sort%20of%20hearing%20disorder. Last updated March 29, 2013; cited December 12, 2020.
3. Dailymirror online. Sri Lanka Terribly short of sign language interpreters. Available from: http://www.dailymirror.lk/News-Features/Sri-Lanka-Terribly-short-of-sign-language-interpreters/131-147833. Last updated March 27, 2018; cited September 28, 2020.
4. Stone A.An introduction to Sri Lankan Sign Language. 1st ed. Matara: Karunaratne & Sons; 2007.
5. Rohana Special School. Specially-trained teachers educate pupils.Available from: https://www.rohanaspecialschool.org/school/. Last updated 2020; cited September 28, 2020.
6. Sri Lanka Technological Campus. The Development of Sign Language Interpreter for Sinhala Language in a Classroom with Hearing Impaired Students.Available from: http://research.sltc.ac.lk/projects/cognitive-computing/p1. Last updated 2019; cited September 28, 2020.
7. FernandoP, Wimalaratne P. Sign Language Translation Approach to Sinhalese Language. GSTF J Comput. 2016 August; 5(1): 52-9.
8. Punchimudiyanse M, Meegama RGN. Animation of Fingerspelled Words and Number Signs of the Sinhala Sign Language. ACM Trans Asian Low-Resour Lang Inf Process. 2017 August; 16(4): 26.
9. Daily FT. Sinhala Sign Language: the main communication mode for the Deaf in Sri Lanka.Available from: http://www.ft.lk/opinion/Sinhala-Sign-Language-the-main-communication-mode-for-the-Deaf-in-Sri-Lanka/14-671078#:~:text=According%20to%20Sri%20Lanka%20Federation,www.whosrilanka.org. Last updated January 18, 2019; cited September 28, 2020.
10. MedicalStatistics Unit. Annual Health Statistics 2017 Sri Lanka. 1 st ed. Colombo: Ministry of Health, Nutrition, and Indigenous Medicine; 2019.

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Experience

Two Student Perspectives on Clinical Medical Education During the COVID-19 Pandemic

Anne P. George,[1] Elise E. Ewens.[1]

The Experience

In the age of COVID-19, the ultimate question in healthcare became who was essential and who was not. Basically, who could be cut from the roster in patient care? Unfortunately, as medical students, many of us did not make that cut. Third-year clerkships are defined by direct patient care and hands-on learning, but in the age of COVID-19, "hands-on learning" has been a bit hard to come by. Hence, COVID-19 has caused many changes in the way medicine is being taught and practiced. This article details the experiences of two medical students from the same institution, working in different locations for their third-year clerkships. We contrast our rural and urban experiences in the time of COVID-19 and attempt to explain the varying experiences students are having during this time. Finally, we touch on the potential ramifications for these wide varieties of experiences from students across the U.S. and how this will affect sub-internships and residency applications.

Urban perspective

My first rotation impacted by COVID-19 was my outpatient psychology rotation. In-person visits shifted entirely to telemedicine, which many institutions across the U.S. seamlessly transitioned to as they were prepared for this change.[1] This was evident in student experiences at the Methodist Hospital in Houston, Texas, where students were essentially physically present in the room with the physician "via video chat on tablets mounted on rolling stands."[2] However, the quality of education received through telemedicine differed from institution to institution, as seen in my rotation site with its inaugural transition to telemedicine. Thus, a significant portion of my time was spent doing clerical and scheduling work rather than taking a history and physical. Patient interaction was limited on this rotation, likely due to the high number of students on this rotation from various schools and the new telemedicine format. Furthermore, while it was certain that students, in both the classroom and the hospitals, felt the effects of online-learning, it also became quickly apparent that many patients also desired to be physically present in the room in order to feel that human connection and trust their provider.[5-6]

My primary care rotations also had many COVID-19 restrictions. During my family medicine rotation, many visits were transitioned to phone visits, and my time was spent listening to the phone conversation between the doctor and patient. Many of the patients who physically visited the clinic were leery of an extra person in the room and would deny requests to have a student observe their appointments or be seen by me prior to the physician.

My internal medicine rotation proved to be much more lenient and with fewer limitations in terms of student involvement as it occurred in more prominent hospitals in the area. However, due to the lack of rotation sites allowing for students, there was an increased student to preceptor ratio. In my case, it was 3:1, which forced us to rotate shifts to avoid crowding patient rooms and decreased our total direct patient hours.

Rural Perspective

My clerkship year consisted of rotations in both a teaching hospital and neighboring outpatient clinics, which, due to COVID-19 screening and policies, were largely unchanged from prior student's experiences. However, during my OB/GYN rotation, I was dismissed from the hospital and was told not to return until further notice.

This no-student policy proved to be problematic moving into my next rotation: surgery. As our school scrambled to find suitable rotations, I was placed last-minute in a surgical clerkship hours away. While the rotation itself was great, it is evident that there was a lack of sites as this rotation had a student to preceptor ratio of 5:1 per surgery.

While many institutions practiced this no-student policy in the U.S., most documented accounts are from the spring of 2020 when students were removed from hospital settings according to the American Medical Association guidelines.[3] Unlike the students in March 2020, this year's current third-year class is roughly only half-way through our required clinical rotations, meaning that many are still trying to determine their specialty of interest. The current situation, particularly with findings of a new variant of the virus, puts even more uncertainty in when medical students will be able to return to normal rotations, even with the distribution of the vaccine. Most importantly, these current rotation closures are contingent on the individual hospital policies regarding student interaction in the hospital. In this sense, there is a discrepancy across medical education as some facilities have not dismissed students, whereas others institutions have. Student dismissal in March was a consensus felt across all institutions throughout the U.S., but this is not the current case.

Conclusion

Our medical education as third-year students during this unique time in history is all about accommodating and making the most of the opportunities we have to learn. Our coordinators and clerkship directors worked to make the best of a difficult situation; however, in researching various other responses to these circumstances, it became apparent that some institutions were better equipped to adapt to the ever-changing situation. Our concern rests mainly on the inequity of clinical opportunities and the resulting disparity in experiences, which has been felt by medical students across the U.S.[4] We feel this pandemic could prevent us from attaining the clinical foundation necessary to be a fully competent resident and are even more concerned about the inequality of training that might lead to varying levels of preparedness among students. Evaluating different student experiences showed us that individual hospital and private practice policies, location, and medical school institution infrastructure have varying roles in what

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clinical experiences third-year medical students have had during this time. We are hopeful that with the administration of the vaccine rotation sites will return to normal protocols regarding student participation, but are unsure due to discovering a new variant. The different experiences we have examined make us concerned that this wide variety of experiences may be detrimental to some students when applying for sub-internships and residency programs.

References

1. Moreno T, Rafael J, Marschke B, Bui S. Telemedicine for Clinical Experiences in the COVID-19 Era of Medical Education: Two Student Perspectives. HMSR. 2020 Jun.
2. Wendt S, Abdullah Z, Barrett S, et al. A virtual COVID-19 ophthalmology rotation. Survey of Ophthalmology. 2021 Mar-Apr;66(2):354-361.
3. Hueston WJ, Petty EM. The Impact of the COVID-19 Pandemic on Medical Student Education in Wisconsin. WMJ. 2020 Jun;119(2):80-82.
4. Garman J. COVID-19: Turning a Pandemic into a Learning Opportunity for Senior Medical Students. Int J Med Students. 2020 Sep-Dec;8(3): 307-308
5. Shatskikh ME, Kirillova A, Shi L. Students Leading a Free Clinic: Lessons Learned About Digital Health in the Age of COVID-19. Int J Med Students. 2020 Sep-Dec;8(3):303-304
6. Thomas A, Shenoy M, Kumar S, et al. Survey Among Medical Students During COVID-19 Lockdown: The Online Class Dilemma. Int J Med Students. 2020 May-Aug;8(2):102-106

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Experience

Mexican Medical Students Protest During COVID-19 Pandemic

Gabriela Torres-Hernández,[1] Patricio García-Espinosa,[1] Edgar Botello-Hernández,[1] Diego Ortega-Moreno.[1]

The Experience

The Protest

On Saturday, February 6th, a protest of about 200 medical students, medical interns, social service physicians (SSF) and graduated physicians was carried out on the outskirts of the city hall of Monterrey Nuevo León - 2nd biggest metropolitan area of Mexico - on the *Explanada de los Héroes* (Esplanade of the Heroes). The protest was organized by senior medical students and coauthors of this manuscript: Patricio García-Espinosa and Gabriela Torres-Hernández, together with other senior students. It was organized through social media networks (Facebook, Instagram, and Twitter) where, a week before the protest, through these channels, instructions were given to maintain a distance of 1.5 meters across the length and width. On the day of the protest, marks were placed along the esplanade. The use of surgical uniform was requested, in order to make identification easier, while the use of facemask and face shield was mandatory. The use of posters was also requested, while the use of umbrellas and rugs was only suggested due to the terrain and varying weather conditions. The time from the protest ranged from 12.00 p.m. to 03.00 p.m. (***Figure 1 and Figure 2***), because at that time the Secretary of Health provides daily update conferences on COVID-19 for the general population.

The protest was covered by local media and featured participation of 4 organizers in the news conference, where the request was presented to the general population (***Figure 3***). For those who were unable to attend, support was asked from their homes, by using the custom profile photo frame on Facebook with the hashtag (#) of the protest; the # used was #*SinSeguridadNoHayServicio* which can be translated as "without security there is no service". The protest occurred with everyone seated, except for the minute of silence dedicated to the SSF and medical interns who have lost their lives by doing their job.

Background

In the last days of January 2021, the SSF Mariana Sánchez of 24 years old was killed while doing her job in a remote community of Chiapas, a state in southern Mexico known for being one of the poorest states in the country.[1] The assassination of Mariana was announced after she reported that she suffered from sexual assault during her service, instead of providing the necessary support, they only told her to take 30 days off and come back to work after that.[2] This occurred few days after the death of Jorge López, 23-year old medical intern, due COVID-19 was announced.[3] The deaths of these young physicians has showed the exploitation of medical health care workers in Mexico, generating protest throughout the country, from medical students and physicians in general.[4,5,6,7]

Figure 1. Medical Students in Front of the Monterrey City Hall (side view).

Figure 2. Medical Students in Front of the Monterrey City Hall (rear view).

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The process of obtaining a medical degree normally lasts for 7 years, divided into 5 years of basic studies, 1 year of rotating undergraduate internships, and 1 year of social services which are normally carried out in hospitals and clinics of the health secretary. The interns have a payment of less than 2000 pesos (approximately 100 U.S. dollars on February 8th, 2021 and less than the minimum Mexican salary) while doing shifts of up to 60 hours a week. SSF, on the other hand, have a payment of less than 4000 pesos (approximately 200 U.S. dollars on February 8th, 2021) with shifts of up to 40 hours a week.[8,9] The failures of the Mexican social service have been well documented previously by Nigenda, G.[8] He exposed that there is a need for social service reform, and that the SSF need to be recognized as workers, and not as students. Insecurity and precarious working conditions have also been documented by reporters of the most important Mexican newspapers.[10] However, social service still to this day remain the same.

Figure 3. Event Organizers at the COVID-19 Press Conference.

Legend: Patricio García-Espinosa, Daniela Capitán, Dr. Manuel de la O Cavazos (Secretary of Health), Gabriela Torres-Hernández, Daniel Bustamante from left to right.

Solutions and Mid-Term Solutions

In the Mexican Official Standard (NOM-009-SSA3-2013) it is established that the organizations responsible for the SSF are the schools and universities, on which the centers where they are being sent to, depend (rural and urban locations and hospitals). Excluding them as formally recognized workers under contract as established by the Mexican federal labor law.[10,11]

The solutions seem clear, and lies in the very foundation of medical social service in Mexico, which was originally organized as part of a scheme to provide outpatient services to rural and poor populations.[12] We recommend the following:

- A reform of social service from the grassroots level.
- The Mexican health system must be able to hire personnel who are permanent in rural areas; or
- They must recognize SSF as formal workers and put them under the protection of a contract that adheres to the benefits which the law requires workers to have.
- To be treated as human beings, not as heroic figures or martyrs.

Mid-term solutions:

- keeping them only in rural areas that can guarantee safety.
- Consider them for vaccination before teachers as planned by federal government or not being forced to serve in COVID-19 areas.

We found this problem due to the idea imposed by the federal and state governments, where physicians must put vocation before integrity and that this allows them to do everything a worker does, but without the benefits of being a worker (***Figure 4 and Figure 5***).[8,12]

Conclusions.

There have been many ways to raise the voice of fellow doctors during these events, asking for justice and better conditions for social service physicians. We decided to make a sit-in because it was the easiest way to have controlled protests due to the COVID-19 pandemic. We believe that in events like these, any way is valid for the voices to be heard about a system that should have reformed years ago, and that show the conditions of labor exploitation in Mexico. We are proud to see the union of Mexican students throughout the country and to belong to the so-called *Generación del Cambio* (Generation of change).

A signed petition sheet was delivered to the authorities, in addition to conducting an online survey with suggestions to improve social service, and on the day of the protest, a box filled with these suggestions was also delivered. For now, the Nuevo Leon's Secretary of Health, Manuel de la O has promised that he will seek to comply with our requests.[13]

Figure 4. Protest Request

Legend: A medical student with a sign that says "All the obligations of a worker without any of the rights"

Figure 5. Protest Request

Legend: "Justice for Mariana"

References

1. Martínez-Rodríguez JC, García-Chong NR, Trujillo-Olivera LE, Noriero-Escalante L. Inseguridad alimentaria y vulnerabilidad social en chiapas: el rostro de la pobreza [Food insecurity and social vulnerability in chiapas : the face of poverty]. Nutr Hosp. 2014 Dec 1;31(1):475-81. Spanish.
2. Domínguez P. Muerte de Doctora en Chiapas refleja que falta un camino largo contra violencia de género: Segob [Death of doctor in Chiapas reflects that there is still a long way to go against gender violence: Segob]. Milenio. Available from: https://www.milenio.com/politica/muerte-doctora-chiapas-camino-violencia-genero Last updated February 1, 2021; cited Feb 9, 2021
3. Heraldo de México. Muere médico interno por Covid-19; denuncian negligencia [Medical intern dies from Covid-19; negligence reported]. Available from: https://heraldodemexico.com.mx/nacional/2021/1/7/muere-medico-interno-por-covid-19-denuncian-negligencia-242718.html. Last updated January 7, 2021; cited Feb 9, 2021.
4. Martín F and Guiérrez O. CNDH y colegios de medicos exigen justicia para Mariana [CNDH and medical associations demand justice for Mariana]. El Universal. Available from: https://www.eluniversal.com.mx/estados/cndh-y-colegios-de-medicos-exigen-justicia-para-mariana. Last updated January 31, 2021; cited Feb 9, 2021.
5. Echeverría M. Exigen justicia por Mariana; se manifiesta personal de salud en CO [Demand justice for Mariana; health personnel protest in CO]. Availble from: https://www.elimparcial.com/sonora/ciudadobregon/Exigen-justicia-por-Mariana-se-manifiesta-personal-de-salud-en-CO-20210204-0018.html. Last updated February 4, 2021; cited Feb 9, 2021
6. Gutiérrez O. Estudiantes de Medicina en Chiapas marchan en protesta por el asesinato de Mariana [Medical students in Chiapas march in protest of Mariana's murder]. El Imparcial. Availble from: https://www.eluniversal.com.mx/estados/chiapas-estudiantes-de-medicina-en-chiapas-marchan-en-protesta-por-el-asesinato-de-mariana Last updated February 5, 2021; cited Feb 9, 2021
7. Cuen, A. "Ni una más"; pasantes alzan la voz en Obregón y exigen justicia para Mariana ["Not one more"; interns raise their voices in Obregon and demand justice for Mariana]. Expreso. Available from: https://www.expreso.com.mx/seccion/sonora/284855-ni-una-mas-pasantes-alzan-la-voz-en-obregon-y-exigen-justicia-para-mariana.html Last updated February 4, 2021; cited Feb 9, 2021
8. Nigenda G. Servicio social en medicina en México: una reforma urgente y posible [Social service in medicine in Mexico: an urgent and possible reform]. Salud Publica Mex. 2013 Sep-Oct;55(5):519-27.
9. Secretaria de Gobernación. NORMA Oficial Mexicana NOM-009-SSA3-2013, Educación en Salud. Criterios para la utilización de los establecimientos para la atención médica como campos clínicos para la prestación del servicio social de medicina y estomatología [Mexican Official Standard NOM-009-SSA3-2013, Health Education. Criteria for the use of health care facilities as clinical fields for the provision of social service in medicine and stomatology]. DOF. Available from: https://www.dof.gob.mx/nota_detalle.php?codigo=5354092&fecha=28/07/2014. Last updated July 28, 2014; cited Apr 12, 2021.
10. Estrada, A. Inseguridad. Médicos pasantes: Acorralados [Social service physicians: Rounded up]. El Universal. Available from: https://www.eluniversal.com.mx/nacion/seguridad/pasantes-de-medicina-acorralados-por-la-inseguridad. Last updated March 12, 2018; cited Feb 9, 2021.
11. Cámara de Diputados del H. Congreso de la Unión. Ley Federal del Trabajo [Federal Labor Law]. DOF. Available from: http://www.stps.gob.mx/bp/secciones/junta_federal/secciones/consultas/ley_federal.html last updated June 13, 2014; cited Apr 12, 2021.
12. Graue Wiechers E. Perspectivas en el futuro cercano [Perspectives for the near future]. Gac Med Mex. 2012 May-Jun;148(3):294-301
13. Villegas G. Exigen pasantes de medicina mejores condiciones [Social service phyisicians demand better conditions]. El Norte. Availble from: https://www.elnorte.com/aplicacioneslibre/preacceso/articulo/default.aspx?__rval=1&urlredirect=https://www.elnorte.com/exigen-pasantes-de-medicina-mejores-condiciones/ar2120237?referer=--7d616165662f3a3a6262623b727a7a7279703b767a783a-- Last updated February 1, 2021; cited Feb 9, 2021

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Experience

Clinical Volunteering through the Pandemic: An Experience from Final Year Medical Students in Nigeria

Boluwatife Aderounmu,[1] Ayodele Odedara.[1]

The Experience

Coronavirus disease 2019 (COVID-19) cases were first confirmed in Wuhan, China in December, 2019.[1] Subsequently, the cases spread throughout the world causing the World Health Organization to declare a pandemic on March 11, 2020.[2] On February 27, 2020, Nigeria confirmed its first case of COVID-19 and a month later imposed a nationwide lockdown.[3]

Progression

The lockdown involved a complete closure of tertiary institutions following a directive by the Ministry of Education on 19th March, 2020.[4] Specifically, medical schools were considered a high-risk institutions due to the possibility of potential exposure of medical students during clinical rotations to patients who may be prone to more severe illnesses due to COVID-19.[5]

Prolonged absences from school could be a challenge for medical students. With the vast amount of new material medical students are expected to learn, a prolonged absence may hinder their learning process due to loss of developing knowledge and clinical skills. To promote continued learning during the lockdown period, some state- and privately-owned medical schools in the country deployed the use of virtual learning environments and online classrooms using platforms such as Zoom.[6] Most federal-owned medical schools were unable to afford their students such privileges, which was partly due to years of chronic underfunding of the educational sector by the government. This resulted in a complete lack of facilities for online learning, which made these institutions unprepared for the situation presented by the pandemic. The few medical schools which offered limited online learning were unable to sustain it beyond a few weeks following the lockdown. This unfortunate scenario has inadvertently prolonged the total duration medical students spend in school, beyond six academic sessions. This has been further exacerbated by a series of industrial actions by various educational and health unions in the past and the present, as institutions remain closed even after the COVID-19 lockdown was lifted, due to an ongoing 8-month strike action by the association of university lecturers.[7,8,9]

Clinical Volunteering – Our Experience

For a period of five months, we had hoped for the resumption of academic activities at our medical school. However, these hopes were lost when the Academic Staff Union of Universities continued the indefinite strike action as soon as the COVID-19 lockdown was lifted, just when medical school was scheduled to resume. Following what seemed to be a hopeless wish for resumption, and the desire to learn despite the circumstances, we decided to volunteer at hospitals in our community.

My name is Boluwatife Aderounmu and I am a final year medical student at the College of Medicine, University of Ibadan. The last eight months have been challenging for me, to say the least. I went from being less than six months away from completing my medical degree, to being forced to take an extra year due to extenuating circumstances. During this period, my family relocated into a new apartment in order to improve our living condition, which coincidentally was close to a privately-owned hospital where I decided to volunteer.

At the start of my rotations, I participated in a training workshop on infection prevention and control strategies. Throughout my rotations, I was careful to implement procedures such as frequent hand washing and proper use of gloves and masks. However, three weeks into my rotations, I began to experience symptoms suggestive of COVID-19 infection, including: fever, malaise, fatigue and a loss of my sense of smell and taste.[10] I immediately began self-isolation, avoiding contact with family and friends and taking time off from the hospital. While I considered taking a COVID-19 test, I was worried about the risk of infecting other members of the society as I would have had to use public transport to get to the testing center. Also, I decided to forgo testing because I did not want to rely on a system that was backed up and often failed to provide quick results. I was worried that several people were experiencing COVID-19 symptoms but could not access testing due to logistical inefficiencies. Instead, I followed the Nigeria Centre for Disease Control COVID-19 guidelines for home care.[11] This included staying in a well-ventilated single room alone, limiting my movement in shared spaces such as the kitchen and bathroom, regularly washing my hands with soap and water, wearing masks to cover my face, amongst other guidelines. My family and friends were supportive by providing food and emotional support during this period. I had heard accounts of poor outcomes which made me anxious and overly conscious of my symptoms. To distract myself from this, I engaged in spiritual and fun activities like prayers, watching movies and social media use. Daily, I ingested the recommended daily dose of Vitamin C and also partook in steam inhalation of peppermint oil. Seven days after the onset of my symptoms, my sense of smell and taste returned and I continued my volunteering at the hospital shortly after.

Following my experience, I became more involved in educating my community about COVID-19 and how to minimize exposure. Most of them believed they were immune to the virus based on their African race and the high temperature of Tropical Africa. I corrected these myths in my local language and advised them to frequently observe the preventive measures. I felt joy while doing this, which more than ever has inspired my interest in public health to promote the health of Nigerians.

Conclusion

The COVID-19 pandemic has been unprecedented with a disrupting effect on education beyond the obvious pathological effects on human life. While there was a disruption, I saw an opportunity to continue my medical education in other ways. My volunteering experience provided

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a learning opportunity that would contribute positively to my medical practice such as learning the importance of understanding my patients' beliefs, which is key to motivating patients to take charge of their own health, improving my clinical skills and increasing the scope of my career options due to an increased interest in internal medicine during this experience. During a difficult time where my studies were interrupted, this has been an opportunity to build upon my medical knowledge and motivate me while I study for final examinations.

I hope the Nigerian educational system shifts to a more intuitive and supportive system for students, and will towards achieving an environment where academic learning is not disrupted and students' interests are valued in extraordinary times such as pandemics and industrial strike actions.

References

1. Yen-Chin L, Rei-Lin K, Shin-Ru S. COVID-19: The first documented coronavirus pandemic in history. Biomedical Journal. 2020.04.007
2. World Health Organization (WHO) Director – General's opening remarks at the media briefing on COVID-19. Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020. Last updated March 11,2020. Cited September 8, 2020.
3. First Case of Coronavirus Disease Confirmed in Nigeria. Available from: https://ncdc.gov.ng/news/227/first-case-of-corona-virus-disease-confirmed-in-nigeria. Last updated February 28, 2020. Cited September 8, 2020.
4. Adebisi YA, Agboola P, Okereke M. COVID-19 Pandemic: Medical and Pharmacy Education in Nigeria. Int J Med Students. 8(2):162-4.
5. Diane B. Wayne, Marianne Green, Eric G. Nelson. Medical Education in the time of COVID-19. Science Advances 29 Jul 2020: Vol. 6, no. 31, eabc7110.
6. Private Universities take the Lead in Online Learning. Available from: https://www.universityworldnews.com/post-mobile.php?story=20200610100106348. Last updated June 11, 2020. Cited September 8, 2020
7. 40 Days of JOHESU Strike: Timeline of Nigeria's Health Sector Crisis. Available from: https://www.premiumtimesng.com/health/health-features/269953-40-days-of-johesu-strike-timeline-of-nigerias-health-sector-crisis.html. Last updated May 27, 2020. Cited September 8, 2020.
8. ASUU Begins Indefinite Strike. Available from: https://www.punchng.com/asuu-begins-indefinite-strike/%3famp=1. Last updated November 5, 2018. Cited September 8, 2020
9. ASUU Begins Indefinite Strike over IPPIS. Available from: https://www.thisdaylive.com/index.php/2020/03/24/asuu-begins-indefinite-strike-over-ippis/amp/. Last updated March 24, 2020. Cited November 6, 2020.
10. Symptoms of Coronavirus. Available from: https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html. Last updated May 13, 2020. Cited November 6, 2020.
11. Interim Guidelines for Home Care of Confirmed COVID-19. Available from: https://www.google.com/url?sa=t&source=web&rct=j&url=https://covid19.ncdc.gov.ng/media/files/National_Interim_Guidelines_for_Clinical_Management_of_COVID-19_v3.pdf&ved=2ahUKEwidh6rO_u3sAhWngVwKHUs7BVcQFjAHegQICRAB&usg=AOvVaw078gJWAt-5S_sXpo1tdHvo&cshid=1604668186983. Last updated July 2020. Cited November 6, 2020.

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Experience

My Experience with Orbis International and the Flying Eye Hospital in Ethiopia

Jibat G. Soboka,[1] Omar Salamanca,[2] Alana Calise.[3]

The Experience

Approximately 80% of blindness in Ethiopia is avoidable. According to the national blindness, low vision and trachoma survey in Ethiopia, over 1.6% of the Ethiopian population is blind, and 3.7% live with low vision. This is higher than the world averages of 1.2% and 3.4%, respectively. The major causes of blindness and visual impairment are preventable or treatable, including cataract and trachoma.[1, 2] Despite the huge burden, human resources available for eye health in Ethiopia are alarmingly low. There are approximately 140 ophthalmologists working to serve the millions of people who are blind and visually impaired, and more ophthalmologists are required to meet urgent eye care needs.[3] The cataract surgical rate in Ethiopia is 500 surgeries per million people, though the expected target is 2,000 surgeries per million.[4, 5] This shows that eye care services need to be increased in Ethiopia to meet the burden of untreated eye disease.

Orbis International in Ethiopia

Orbis is a global nonprofit that has been a pioneer in training eye care teams to prevent and treat blindness for nearly 40 years. Orbis began working in Ethiopia in 1998. Over the past 20 years, Orbis has achieved a lot in Ethiopia. One of the ways in which Orbis delivers training is through its Flying Eye Hospital, a state-of-the-art surgical teaching facility with an operating room (***Figure 1***), classroom, and recovery room, all onboard an airplane (***Figure 2***).[6]

The Flying Eye Hospital has visited Ethiopia five times, in 2003, 2005, 2006, 2012, and 2018, to provide additional training to address the burden of blindness and reduce the shortage of trained eye care professionals.[7] The Flying Eye Hospital visits provided opportunities for Ethiopian eye care teams to develop their skills.[8]

My Experience

I took part in a three-week Orbis project in Ethiopia from October 1-18, 2018, which provided ophthalmic training on the Flying Eye Hospital and at Menelik II Hospital (Menelik II), a teaching hospital in Ethiopia's capital city, Addis Ababa. Eye care teams from other teaching hospitals and eye care centers across Ethiopia were trained as well. The project aimed to strengthen the capacity of eye health professionals by delivering subspecialized eye care services and residency training.

Patient Coordination

As a chief resident, a key organizational role I held prior to and during the Flying Eye Hospital project was supporting case communication between Ethiopian ophthalmologists, visiting Orbis Volunteer Faculty (medical experts), and patients. I prepared case summaries and uploaded the data to Orbis's Cybersight telehealth platform, through which Volunteer Faculty could review the cases prior to arrival.[9] Case types included newly diagnosed patients, known patients with complications or previously failed surgeries, and cases of academic importance. Patients were selected for treatment based on factors which included but were not limited to: suitability for teaching, having conditions affecting both eyes, blindness risk, age, and predicted surgical prognosis. However, treatment plans were discussed for all patients, whether or not they were selected for treatment. After online

Figure 1. Operating Room Within the Flying Eye Hospital

Figure 2. Patient Discharged After Treatment onboard the Flying Eye Hospital

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review by Volunteer Faculty, patients were selected for in-person screening, where the Ethiopian ophthalmologists and Volunteer Faculty worked together to determine a treatment plan. At the in-person patient screening, I was responsible for organizing the patient log books for the Ethiopian ophthalmologists and provided critical communication to patients about their treatment plan, logistics, and scheduling. In addition to patient organization, I was involved in a different training program each week.

Week One: Glaucoma Simulation

Wet lab training included both lectures and simulated surgical training. As a chief resident, it was a great opportunity to simulate glaucoma surgery on high-fidelity model eyes. The wet lab training focused on trabeculectomy, a surgical technique to treat advanced glaucoma. I was able to practice every step of the surgery on the model eyes (***Figure 3***). The experience I was able to get using model eyes was less stressful as compared to real-time surgical training. At the end of the project, Orbis donated model eyes and wet lab equipment to Menelik II, so I have been able to continue to practice my surgical skills.

Figure 3. Simulated Surgery in the Menelik II Wet Lab

Week Two: Phacoemulsification Simulation

This was my first experience using a virtual reality simulator for phacoemulsification surgery (***Figure 4***). Using the simulator onboard the Flying Eye Hospital, I was able to receive training and practice the steps required for a successful phacoemulsification case. Live patient surgeries were broadcast from the plane's operating room to its 46-seat classroom. Between simulation cases, I was able to watch live surgical cases, ask questions of the surgeons in real-time, and sit in on lectures. Through the simulation and live surgical case observation, world-renowned ophthalmic surgeons taught me about different surgeries to treat eye diseases.

Figure 4. VR Magic Eyesi Surgical Simulator

Week Three: Hands-on Training in Medical Retina

I was able to participate in a hands-on training, treating patients with retinal pathology. I was exposed to different methods and equipment used to diagnosis retinal disease, including indirect ophthalmoscopy, fundus photography, and optical coherence tomography (OCT). Most patients involved were diabetics with an eye complication called diabetic retinopathy. Diabetic retinopathy is one of the leading causes of blindness worldwide, and it is an emerging cause of blindness in Ethiopia.[10] With guidance from Volunteer Faculty, I provided pan-retinal photocoagulation laser treatment for patients with diabetic retinopathy for the first time. At the three-month follow-up mark, the patients' diabetic retinopathy was still under control.

Conclusion

The opportunity to engage with and learn from world-class doctors was a great experience for me as a resident in Ethiopia. My experience with the Flying Eye Hospital was multi-faceted and fascinating. Orbis brought state-of-the-art services and education to Ethiopia, and the training was inspiring. I organized, observed, and trained both in simulation and with patients. The training improved my skills to provide quality eye care services in Ethiopia.

Through the Orbis training experience, the proverb "Give a man a fish, and you feed him for a day. Teach a man to fish, and you feed him for a lifetime!" will be a source of encouragement to serve and improve the future of eye care services in Ethiopia. The training I received will help me treat blindness now and in the future.

References

1. Berhane Y, Worku A, Bejiga AJAAFMoHoE. National survey on blindness, low vision and trachoma in Ethiopia. 2006.
2. Berhane Y, Worku A, Bejiga A, Adamu L, Alemayehu W, Bedri A, et al. Prevalence and causes of blindness and low vision in Ethiopia. Ethiopian Journal of Health Development. 2007; 21(3): 204-10.
3. Kletke SN, Soboka JG, Dimaras H, Sherief ST, Ali A. Development of a pediatric ophthalmology academic partnership between Canada and Ethiopia: a situational analysis. BMC Med Educ. 2020 Nov 16;20(1):438.
4. Palmer JJ, Chinanayi F, Gilbert A, Pillay D, Fox S, Jaggernath J, et al. Mapping human resources for eye health in 21 countries of sub-Saharan Africa: current progress towards VISION 2020. Hum Resour Health. 2014 Aug 15;12:44.
5. WHO. Cataract Surgical Rate. 2003; Available from: https://www.who.int/blindness/data_maps/cataract_surgery_rate/en/.
6. International O. Our work in africa. Available from: https://www.orbis.org/en/orbis-africa?geographicregion=www. Cited: December 18, 2020.
7. Hospital FE. What we are doing to tackle global blindness. Available from: https://www.orbis.org/en/what-we-do/flying-eye-hospital. Cited: December 18, 2020.
8. Szamocki SJIJoOP. Aboard the Flying Eye Hospital from London to Pampanga. International Journal of Ophthalmic Practice. 2014; 5(6): 237-40.
9. Cybersight. Online Training And Mentorship For Eye Health Professionals In Developing Countries. Available from: https://cybersight.org/online-learning/. Cited: December 18, 2020.
10. Azeze TK, Sisay MM, Zeleke EGJBrn. Incidence of diabetes retinopathy and determinants of time to diabetes retinopathy among diabetes patients at Tikur Anbessa Hospital, Ethiopia: a retrospective follow up study. BMC Res Notes. 2018 Aug 2;11(1):542.

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ULS

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Experience

Telemedicine Volunteering Experience as a Medical Student During the COVID-19 Pandemic in Brazil

Tulio L. Correa,[1] Mariana S. T. C. Guelli.[2]

The Experience

The coronavirus disease 2019 (COVID-19) pandemic has strongly affected Brazil in many different ways, and the country is considered an epicenter of the new disease. With over 5.5 million confirmed cases and 160 thousand deaths by November 2020,[1] the country's healthcare system has been oversaturated during the pandemic. Since COVID-19 is a highly transmissible disease, to avoid its spread in society, many universities canceled in-person classes for an indefinite period. To deal with both situations (healthcare system oversaturation and high transmissibility of the virus), many Brazilian medical students enrolled themselves as volunteers in telemedicine services across the country. In confronting both the health care saturation and the high transmissibility of the virus, Brazilian medical students immediately jumped to the opportunity to volunteer with the country's telemedicine services. This was a particularly unique opportunity, given the fact that although we have always wanted to volunteer, in medical school it was not a possibility due to our schedules.

Volunteering is not only about giving your time out of solidarity to a cause you believe in. It also has the potential to be profitable for both parts and it increasingly occupies spaces for training, education, and professionalization of those involved.[2] In this sense, medical students enrolled in telemedicine may enhance their clinical and communication skills in a period when in-person clinical training is not possible to be carried out by many students.

Volunteerism is composed of people who perform social work that reaches areas which the Public Sector is unable to cover effectively.[3] The non-governmental organization Médecins Sans Frontières (MSF) announced that Brazil was not testing adequately during the peak of the COVID-19 pandemic, with 7,500 tests per million people.[4] Thus, during a pandemic where the lack of available healthcare resources may pose risks to many lives, telemedicine plays an essential role in partially relieving the country's overwhelmed healthcare system. Nevertheless, the MSF reported that nearly 100 nurses were dying from the disease per month during the peak of the COVID-19 pandemic in Brazil, being the fastest rate globally.[4] Given that in-person contact helps spread the disease, telemedicine can be a useful tool to avoid new infections. In this way, some medical care can still be provided without exposing the health professionals and the patients to one another. Many medical decisions are predominantly cognitive, and telemedicine can therefore deal with less severe and non-life-threatening cases, patient follow-up, and patient referral to more specialized health facilities if necessary.

In a nation of considerable size like Brazil, the different regions of the country can face different pandemic phases at different times. In this regard, since medical students or volunteer doctors do not have to leave their houses, telemedicine is also a great strategy that promotes better allocation of health professionals to more distant areas that are facing a worse pandemic phase and have fewer resources to cope with the health crisis. To date, more than 15 thousand free telemedicine consultations have been carried out in 135 different cities across Brazil through the telemedicine service we are involved in.

In our experience, medical students have been allocated to give telemedicine assistance. We screen patients according to priorities, mainly symptoms and, family and economic history. Then we fill out the patients' medical records and schedule appointments. Contact with patients is very interesting and, in general, they are very receptive, grateful, and friendly. The increased demand for medical services during the pandemic can be an obstacle to formal medical teaching in clinical scenarios since attending physicians may not have enough time to explain the cases to the students because they are busy with too many patients. Even though we have contact with patients and their medical records, our performance is limited to medical screening and succinct history taking. Lacking in this is more direct clinical experience together with an attending physician, which is a disadvantage for medical learning. Despite that, we can still practice our communication and history-taking skills and, improve our medical knowledge by studying the cases we had contact with, leading to a worthwhile learning experience in our medical studies.

Nevertheless, it is known that undertrained medical students in combination with their unfamiliarity of the latest clinical guidelines can pose a risk to the country's public health.[5] Since telemedicine is a new tool for the majority of students, preliminary and continued training are essential to offer high-quality health services. In this matter, during our volunteering experience, the project's staff offered us materials that guide how to access and deal with the virtual platforms. In addition, at the weekly meetings, those responsible for training explained in detail everything that must be done to ensure patient care was satisfactory and effective. After a certain period of working in the same role, volunteers receive new training to be prepared to assume new roles in the project. With this, the experience becomes broader, allowing a comprehensive knowledge of the project's functioning.

Besides COVID-19 cases, our telemedicine volunteering experience also uses video calls to aid patients with medical conditions across several medical fields, such as pediatrics, obstetrics and gynecology, psychiatry, dermatology, oncology, ophthalmology, allergology, cardiology, sports medicine, geriatrics, otorhinolaryngology, and other infectious diseases. However, we noticed a high prevalence of need for psychological assistance, especially among the elderly. The reasons are

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diverse and often have a deep relationship with the current reality of the pandemic, consisting of social isolation, fear, and the possibility of seeing their relatives dying, something also mentioned in other experiences.[6] COVID-19 has contributed to a significant increase in stress, anxiety, and depression rates worldwide.[7] To combat this, online mental health services were widely implemented in China during the outbreak to alleviate psychological distress,[8] showing how important these aids are during pandemic times.

We believe that telemedicine volunteering is an overall positive experience in medical training that helps to attenuate the deficits from remote teaching. COVID-19 may change the way medicine is performed in many different manners and it is important to train medical students so that the new generation of medical doctors are capable of using technological support to manage unfavorable situations. Being part of telemedicine and helping people receive high-quality and free health care also generates in us the gratitude for the opportunity to make an impact in people's lives during difficult times.

References

1. Brazil Ministry of Health. Panel of coronavirus disease 2019 (COVID-19) cases in Brazil by the Ministry of Health. Available from: https://covid.saude.gov.br. Last updated November 04, 2020; cited Nov 04, 2020.
2. Cimino V, Dias AR, Moyses EA, Folch S. The benefit of volunteer work: a study about the importance of the volunteer work on Associação Viva e Deixe Viver. Revista Eletrônica Gestão e Serviços. 2018 Jan-Jun;9(1):2147-63.
3. Salci MA, Casado JM, Wakiuchi J, Paiano M, Charlo PB, Sales CA. Signifying the Voluntary Work at an Oncologic Support House. Esc. Anna Nery. 2020 Jun 29;24(4):e20190334.
4. Médecins Sans Frontières. Brazil's COVID-19 nightmare is far from under control. Available from: https://www.msf.org/coronavirus-covid-19-nightmare-continues-brazil. Last updated June 17, 2020; cited Nov 04, 2020.
5. Potolidis D. Medical Volunteerism in Times of COVID-19: Burden or Relief? Int J Med Students. 2020 May-Aug;8(2):152-53.
6. Nicolalde B. The Role of Telemedicine on Ecuador During the COVID-19 Crisis: A Perspective from a Volunteer Physician. Int J Med Students. 2020 May-Aug;8(2):154-55.
7. Bao Y, Sun Y, Meng S, Shi J, Lu L. 2019-nCoV epidemic: address mental health care to empower society. Lancet. 2020 Feb 22;395(10224):e37-e38.
8. Yao H, Chen JH, Xu YF. Patients with mental health disorders in the COVID-19 epidemic. Lancet Psychiatry. 2020 Apr;7(4):e21.

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Experience

Learning from Hispanic Mentees: A Reflection on Cultural and Socioeconomic Differences

Dana Rector,[1] Mary A. Nowlen.[2]

The Experience

The Hispanic Newcomer Outreach Mentoring Program provides medical students at Oakland University William Beaumont School of Medicine the opportunity to be partnered with local Latinx children from Pontiac, Michigan in order to promote community relationships and health education.[1] This year-long program is structured around weekly phone calls as well as weekend health lessons and activities that bring the mentors and mentees together. We, the authors, quickly discovered a commonality with our mentees beyond our female gender: we are all the eldest children in our families. Over the past year, we grew closer to our mentees than we could have imagined. Initially, our phone calls focused primarily on school, but soon transformed into hour-long conversations about relationships, stressors, and aspirations. Through this mentoring program, we further developed our cultural humility and challenged our preconceptions by viewing the role of the eldest daughter through the lens of socioeconomic status, gender roles, and culture.

Dana's mentee, Arianna*, is 12 years old and the eldest daughter with three younger siblings. Mary's mentee, Lucia*, is 15 years old and the eldest daughter with four younger siblings. They are both responsible for cooking, cleaning, doing the laundry, and taking care of their younger family members – like second mothers. In contrast to our experiences as the eldest daughters, our parents or nannies shouldered most of these chores during our childhoods. Due to their families' socioeconomic status, Arianna and Lucia assumed caretaking responsibilities at a much younger age than we did, causing them to fulfill roles that we will not experience until we have our own children. Research shows that socioeconomic challenges may result in an increase in childhood responsibility[2]; however, we were impressed with the maturity of our mentees when confronted with this reality.

Many socioeconomic barriers have recently been exacerbated by the COVID-19 pandemic, and children have been particularly affected as a result of school shutdowns. For Arianna, homeschooling means that she frequently misses class because her Wi-Fi fails, and she has a hard time focusing on homework because she lacks a quiet workspace due to her siblings playing in the background. For Lucia, online school means juggling the responsibilities of caring for her infant sister and ensuring that her other siblings focus on their schoolwork while simultaneously trying to attend her online classroom and completing her own assignments. This mandatory online learning also impacted the mentoring program; therefore, novel solutions were implemented in order to maintain an educational, yet fun, learning experience.[3] Due to COVID-19, children from lower socioeconomic groups face disproportionate barriers in education such as lack of reliable internet and access to appropriate books, thereby further intensifying educational inequalities.[4]

The nuances of gender roles within a culture are an integral part of identity that can have a long-lasting influence on education and career opportunities.[5] Some of the differences in gender roles between our families and our mentees' were evident in Arianna's experiences. For example, Arianna is often asked to help with cleaning and other chores while her brother is not, allowing him to start on homework or play outside. In contrast, while acknowledging the variability in gender roles within Western culture, our parents had similar expectations for all their children. Although this dichotomy in gender roles was observed, potentially due to cultural expectations, it cannot be extrapolated to all Mexican families due to the significant variability within their culture.[5] Despite these traditional gender roles, Arianna studies diligently and maintains her extracurricular interests so that she can achieve her goals.

Developing close relationships with our mentees allowed us to deepen our own cultural humility. Cultural humility is a life-long, fluid process of self-reflection and critique in the pursuit of learning about one's own culture and new cultures driven by curiosity.[6] For example, Lucia's mentor encouraged her to ask her siblings to help with housework to allow more time for her to study or talk with friends; however, Lucia refused because she did not want to inconvenience her younger siblings. This brief interaction revealed that Lucia was unlikely to accept suggestions if they were too far outside her norm. Learning from interactions like these, we have tried to provide advice that could be beneficial to our mentees while still being sensitive to their personal preferences and cultural norms. Providing culturally-centered care is a skill that, with practice, can become habitual and promote patient involvement in decision making.[7-8] As future physicians, this year-long relationship helped us develop skills in communicating with people from cultural backgrounds different from our own.

In our medical school training, we have learned about the negative impact of implicit bias as well as the benefit of contact theory which argues that interaction with people from different backgrounds can help diminish stereotypes.[9] This mentoring program provides the opportunity to challenge previous biases so that, once aware of it, we can actively work to diminish negative stereotypes. By building a relationship with our mentees, we were able to better understand them as individuals and broaden our perspectives.

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As the eldest daughters, we all love our siblings and try to guide them; however, we have different responsibilities which is due, at least in part, to our socioeconomic, cultural, and gender role differences. Although we have learned about the effects of socioeconomic disparities and culture in class, witnessing them in our mentees' lives has challenged us to reevaluate the impact they might have in the everyday lives and viewpoints of our future patients. The development of these insights highlights the importance of similar long-term experiences for all medical students. Our mentees have transformed our perspectives as medical students and mentors, evolved our cultural humility, and will positively impact our future practice as physicians.

References

1. Peters M, Asare B, Whitaker C, Rogers R, Huetteman H, Espinoza CM, et al. (in press). Medical Students as Mentors of Latinx Youth: A Model for Increasing Cultural Competence and Community Engagement in Medical Schools. J High Educ Outreach Engagem.
2. Conlon C, Timonen V, Carney G, Scharf T. Women (Re)Negotiating Care across Family Generations: Intersections of Gender and Socioeconomic Status. Gend Soc. 2014 May;28(5):729–51.
3. Kim CM, Silverman BR, Cortes C. The Challenges and Opportunities of Sustaining Academia-Sponsored Community Service Programs for Latinx Youth During the COVID-19 Pandemic. J Hispanic High Educ. 2020 Dec.
4. Van Lancker W, Parolin Z. COVID-19, School Closures, and Child Poverty: a Social Crisis in the Making. Lancet Public Heal. 2020;5(5):e243–4.
5. Updegraff KA, McHale SM, Zeiders KH, Umaña-Taylor AJ, Perez-Brena NJ, Wheeler LA, et al. Mexican-American Adolescents' Gender Role Attitude Development: the Role of Adolescents' Gender and Nativity and Parents' Gender Role Attitudes. J Youth Adolesc. 2014 Dec;43(12):2041–53.
6. Yeager KA, Bauer-Wu S. Cultural Humility: Essential Foundation for Clinical Researchers. Appl Nurs Res. 2013 Nov;26(4):251–6.
7. Derck J, Yates E, Kuo M, Hwang C, Sturdavant W, Ross P, et al. Exploring the Impact Factor: Medical Students Mentoring High School Students and Cultivating Cultural Humility. Heal equity. 2018 Mar;2(1):15–21.
8. Juarez JA, Marvel K, Brezinski KL, Glazner C, Towbin MM, Lawton S. Bridging the Gap: a Curriculum to Teach Residents Cultural Humility. Fam Med. 2006;38(2):97–102.
9. University of Minnesota Libraries Publishing. Sociology: Understanding and Changing the Social World, Chapter 3.2 The Elements of Culture. Available from: https://open.lib.umn.edu/sociology/chapter/3-2-the-elements-of-culture/; Last updated 2010; cited 2021 Jan 8.

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Experience

Service Learning Goes Virtual in the Viral World

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The Experience

The current healthcare environment obliges medical schools to include a principle of community partnership within a medical education. This should provide medical students the skills to practice in a rapidly changing health environment.[1] Throughout the COVID-19 pandemic, medical schools were challenged with providing community engaged learning to their students.[2,3] Service learning, a learning experience that combines community service with preparation, planning, engagement, and reflection, is an example of the community-engaged learning that faced these challenges during the pandemic.[4] Service learning is a required activity at our medical school and fits well with the mission of our school, which includes advancing the well-being and health of our community through patient-centered care. Our school aims to train excellent clinicians who are compassionate and will serve as advocates for their communities.

The middle school where we performed our service learning was like most other schools in the country this fall. In August, the school announced its plan to roll out a virtual curriculum. However, a group of 6th, 7th, and 8th graders experienced a curriculum that was quite different. Twice a week, these students met virtually with two medical students and experienced what it meant to be a professional healthcare worker. We implemented a theme of "Training to Live as a Healthy Professional" - a play on words to teach the students about being a "professional of being healthy", and also to serve as an exposure to healthcare as a profession. We hoped to encourage the students to living healthy and to give them the tools to enter a healthcare profession. Many of the students are from underserved communities and never considered this profession as an option.

We structured our time to focus on "training to think like medical professionals", with interactive scenarios to understand clinical reasoning, integrating valuable nutritional and exercise lessons, and included a session on approaching the challenges of telemedicine.

This infusion into the virtual curriculum provided a great opportunity for the students to interact and learn through an exciting medium. Previously, others have reported that learning through an online platform may present challenges with interaction and stimulation.[5] We aimed to avoid these challenges through question-provoking lessons, quiz contests, and role playing. The lessons learned also resonated with the children and showed them a bright promise for their futures. In a time when the pandemic presented many challenges, these students gained valuable opportunities, lifelong lessons, and new friendships.

Working with these students allowed us to take a step back from learning about the medical field and instead, teach about it. The students showed us that it is never too early to begin understanding the basics of biology and to be introduced to its real-world clinical implications such as obesity, diabetes, heart disease, and rare genetic diseases. We found that teaching, even such young minds, gave us a chance to practice communication with those that have not been learning medicine daily - a glimpse of what the future holds for us. The importance of medical students teaching children and thus sharpening teaching skills has been emphasized by others previously.[6] We similarly felt that this experience allowed us to assume a teaching role that will aide us in the future and improve our overall clinical and mentoring capabilities.

We came out of this experience with renewed enthusiasm towards involvement in the community. We want to impart the idea that once we are doctors, we should ensure that our patients feel comfortable to participate in discussions regarding their health and medical diagnoses, and most importantly, to remember that as doctors we will also be teachers. At a time when medical disease and treatments are at the forefront of every conversation, educating our children, patients, and communities is of the utmost importance.

References

1. Hunt JB, Bonham C, Jones L. Understanding the goals of service learning and community-based medical education: a systematic review. Acad Med. 2011 Feb;86(2):246–51.
2. Tsima BM, Masupe T, Setlhare V. Service-learning in response to the coronavirus disease 2019 pandemic: Emerging lessons from the Department of Family Medicine and Public Health at the University of Botswana. African J Prim Heal Care Fam Med. 2020 Jun;12(1):e1–3.
3. Correa TL, Guelli MSTC. Telemedicine Volunteering Experience as a Medical Student During the COVID-19 Pandemic in Brazil. Int J Med Students. 2021 Jan-Apr;9(1):71-2.
4. Prakash N, Grunhut J, Howard H. Is Community-engaged Learning Possible During a Pandemic: A Call for Culturally Competent Medical Education. MedEdPublish. 2020;9(1):1–8.
5. Thomas A, Shenoy MT, Shenoy KT, Suresh Kuma S, Sidheeque A, Khovidh C, et al. Survey Among Medical Students During COVID-19 Lockdown: The Online Class Dilemma. Int J Med Students. 2020 May-Aug;8(2):102-6.

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6. Cline L, Canales M. From Student to Teacher: Medical Student Perceptions of Teaching Children and a Novel Application of the One Minute Preceptor. Int J Med Students. 2020;8(3):245–50.

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Experience

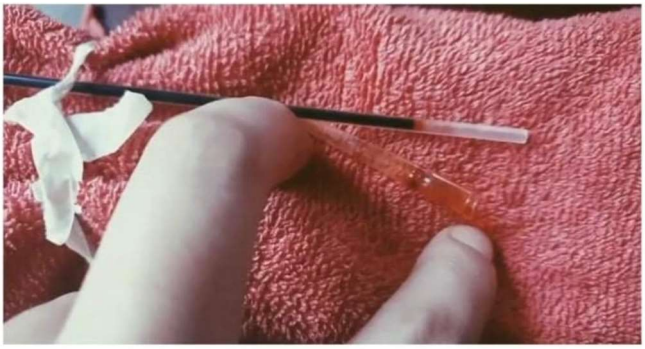
Learning Strategies and Innovations among Medical Students in the Philippines during the COVID-19 Pandemic

Trisha Denise D. Cedeño,[1] Ian Christopher N. Rocha,[1] Kimberly G. Ramos,[1] Noreen Marielle C. Uy.[1]

The Experience

As of February 10, 2021, coronavirus disease 2019 (COVID-19) has spread across 219 countries and territories around the world, with 106,321,987 confirmed cases worldwide[1] and 541,560 confirmed cases in the Philippines,[2] since it was initially identified in Wuhan, China on December 31, 2019.3 Due to increasing cases, many countries have imposed preventive measures to contain the virus which include the closure of schools, colleges, and universities.[4-7]

Figure 1. An intravenous injection simulation using improvised materials.



Our online learning classes started 11 months ago when the Philippine government imposed a community quarantine on March 10, 2020.[7] Due to the continuous rise in number of cases, an Enhanced Community Quarantine (ECQ) was imposed after one week.[8] Under the ECQ, residents were not allowed to leave their homes except in cases of emergency and essential reasons.[8] Because of this preventive measure, almost all educational institutions shifted to online education. Despite the class suspensions, students were advised to fulfill their educational requirements during the ECQ period.

Our institution opted to use online platforms to facilitate continuous learning processes. This abrupt shift to an online curriculum has enabled creativity, innovation, and adaptability among students and professors alike.[9,10] However, it has also increased stress and, possibly, the toll on mental health and financial burden among the school community. Various contributing factors include difficulty in adjusting learning strategies, the need for new laptops, smartphones, and tablets, having to perform responsibilities at home, poor internet connectivity, and other unexpected events such as natural calamities.[11-15]

Our institution employed various strategies and innovations to accommodate for the loss of face-to-face encounters, especially those that need to be in the hospital setting. Training materials were not easily accessible and available, thus giving rise to various improvisations. For instance, in Pharmacology, we were required to perform the various parenteral routes of drug administration. Due to the strict ECQ implementation, a student resorted to using a towel to simulate a patient's arm, ballpen refills to simulate blood vessels, and a makeshift cotton holder using pens, cotton, and tape ***Figure 1***. Meanwhile, other students used stuffed toys to serve as their patients ***Figure 2***.

As incoming senior students, we were excited to practice the theoretical knowledge we learned in school by undertaking rounds and meeting actual patients. In the context of this pandemic, we were caught up in the uncertainty of when we would go back to school and the possibility of being the next front-line workers in the hospitals. Despite the challenges, the Filipino spirit of resilience persevered as we adapted to the constant changes, completed all the academic requirements, and we were promoted as clinical clerks in May 2020. In the Philippines, a 4-year Doctor of Medicine program consists of 3 academic years and 1 clinical year, which is the clinical clerkship.[16]

Our clinical clerkship, or final year, formally started on June 1, 2020. Had it not been for the pandemic, the usual setup for clinical clerks was supposed to be done in community and hospital settings. The cohort one year ahead of us spent their time at a tertiary level teaching hospital. However, for our cohort, everything was conducted online. We spent the first half of our clerkship in the comforts of our own homes as it would be dangerous to deploy us into hospitals due to risks of infection and/or transmission of COVID-19.

Figure 2. A clinical skills simulation on the preparation and administration of parenteral medications on stuffed toys as simulated patients.

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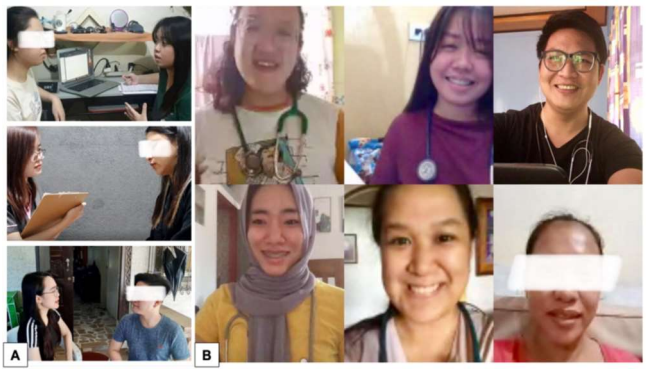
For the first half, our clerkship syllabus included online rotations among the major departments, namely, Internal Medicine, Obstetrics and Gynecology, Pediatrics, and Surgery, and the minor departments, namely, Family and Community Medicine, Psychiatry, Radiology, Orthopedics, Otorhinolaryngology, and Ophthalmology. This entailed small group discussions (SGDs), presentation of assigned topics, and webinars held online. For the second half, which began in December 2020, the focus was on clinical skills among the major departments. At present, clinical clerkship in the hospital remains uncertain. In the meantime, while compromises are being made in hospitals, online adjustments and leniency are in place.

Figure 3. **(A)**. Patient encounter simulations during our rotations in Internal Medicine, Obstetrics and Gynecology, and Surgery, **(B)**.Screenshot image of a real virtual patient encounter during our Family and Community Medicine rotation via Facebook Messenger (photo posted with consent from the patient)



Online rotation activities include clinical case discussions and conferences, patient encounter simulation scenarios, interactive SGDs, and reporting sessions via Zoom and/or Google Meet. For patient encounter scenarios, students are tasked to make a video recording of simulated clinical history taking and physical examination with their family members as their patients, which is subsequently presented during SGD sessions ***Figure 3A***. Some rotations do not require videos but discuss real-life written clinical cases virtually ***Figure 4***. The most unforgettable experiences include a virtual patient encounter with a real patient in our Family Medicine rotation ***Figure 3B***, and a virtual episiorrhaphy workshop on a chicken as a simulated reproductive organ of a postpartum patient during our Obstetrics rotation ***Figure 5***. Some mobile applications, such as Touch Surgery and Docquity, are also useful.[17,18] Meanwhile, quizzes and exams are completed at the end of rotations via Google Forms, Microsoft Forms, and/or Edmodo.

It seems easy to handle learning online until you get to the point where actual skills have to be tested and practiced. Online learning has limitations on medical skills which require things to be felt, heard, and seen – all things that need to be tangible to practice the clinical eye. Despite all the challenges, there are also benefits. For instance, it is easier for preceptors to monitor attendance as well as for everyone to hear each other speak since voices are magnified through headphones, earphones, or speakers. Students can now easily go back and review the live online lectures since some professors allow the recording of online classes. The preceptors also give ample time for the students to prepare for their classes and exams. The pandemic blessed everyone with a deeper sense of understanding and consideration of individual struggles and personal life matters.[9,10,12,19]

Figure 4. Screenshot images of interactive SGDs with preceptors via Zoom meetings during our Internal Medicine rotation.

Figure 5. Virtual workshop and simulation of episiorrhaphy on a chicken during our Obstetrics and Gynecology rotation.

It cannot be denied that the past 11 months was an uphill climb with constant struggle to study and stay on track to become physicians. Nonetheless, this pandemic has brought medical school to our homes and has given us more time to reflect on the pressing national issues affecting the health of the Filipino people. It is also a great opportunity to find a deeper meaning on our chosen career path and a strong motivation to become better physicians in the future.

References

1. World Health Organization. WHO coronavirus disease (COVID-19) dashboard. Geneva: World Health Organization; 2021 Available from: https://covid19.who.int. Cited Feb 10 2021.
2. Department of Health. COVID-19 tracker [Internet]. Manila: Department of Health; 2021. Available from: https://doh.gov.ph/covid19tracker. Cited Feb 10, 2021.
3. World Health Organization. Listings of WHO's response to COVID-19 [Internet]. Geneva: World Health Organization. Available from: https://www.who.int/news/item/29-06-2020-covidtimeline. Last updated: Dec 28, 2020, cited Feb 10, 2021.
4. Buonsenso D, Roland D, De Rose C, Vásquez-Hoyos P, Ramly B, Chakakala-Chaziya JN, Munro A, González-Dambrauskas S. Schools closures during the COVID-19 pandemic: a catastrophic global situation. Pediatr Infect Dis J. 2021 Jan 12.
5. Vlachopoulos N, Smyrnakis E, Stachteas P, Exindari M, Gioula G, Papa A. Medical students during COVID-19 pandemic: lessons learned from response teams in Greece. Int J Med Students. 2020 14 May-Aug;8(2):191-193.
6. Thomas A, Shenoy MT, Shenoy KT, Suresh Kumar S, Sidheeque A, Khovidh C, Pillai JP, Pillai PM, Sherin CH, Mathew A, Zakkir T, Dileep S, Mekha V, Raju S, Junaid K, Sivendu P. Survey among medical students during COVID-19 lockdown: the online class dilemma. Int J Med Students. 2020 May-Aug;8(2):102-106.
7. Presidential Communications Operations Office. Gov't imposes community quarantine in Metro Manila to contain coronavirus. Manila: Presidential Communications Operations Office. Available from: https://pcoo.gov.ph/news_releases/govt-imposes22 community-quarantine-in-metro-manila-to-contain-coronavirus/. Last updated: Mar 13, 2020, cited Jan 11, 2021.
8. Merez A. Luzon quarantine: a breakdown of implementing guidelines. ABS-CBN News. Available from: https://news.abs-cbn.com/news/03/17/20/luzon-quarantine-a-breakdown-of-the-implementing-guidelines. Last updated: Mar 17, 2020, cited Jan 11, 2021.
9. Pacheco Carrillo AM. The utility of online resources in times of COVID-19: a Mexican medical student point of view. Int J Med Students. 2020 Jan-Apr;8(1):58-59.
10. Seymour-Walsh AE, Bell A, Weber A, Smith T. Adapting to a new reality: COVID-19 coronavirus and online education in the health professions. Rural Remote Health. 2020 May;20(2):6000.
11. Baticulon RE, Sy JJ, Alberto NRI, Baron MBC, Mabulay REC, Rizada LGT, et al. Barriers to Online Learning in the Time of COVID-19: A National Survey of Medical Students in the Philippines. Med Sci Educ. 2021 Feb 24;1-12.
12. O'Doherty D, Dromey M, Lougheed J, Hannigan A, Last J, McGrath D. Barriers and solutions to online learning in medical education: an integrative review. BMC Med Educ. 2018 Jun 7;18(1):130.
13. Adebisi YA, Agboola P, Okereke M. COVID-19 pandemic: medical and pharmacy education in Nigeria. Int J Med Students. 2020 May-Aug;8(2):162-163.
14. Medina-Gaona LA. Clinical skills abilities development during COVID-19 pandemic in Mexico City. Int J Med Students. 2020 May-Aug;8(2):175-176.
15. Maharaj S. South Africa and COVID-19: a medical student perspective. Int J Med Students. 2020 May-Aug;8(2):186-187.
16. Commission on Higher Education. Policies, standards and guidelines for the Doctor of Medicine 2 (MD) program [Internet]. Quezon City: Commission on Higher Education; 2016. Available from: https://ched.gov.ph/wp-content/uploads/2017/10/CMO-18-s.-2016.pdf. Cited Feb 3, 2021.
17. Mandler AG. Touch Surgery: a twenty-first century platform for surgical training. J Digit Imaging. 5 2018 Jun;31:585-590.
18. Pante JL. Docquity app now available for local medical professionals. Manilla Bulletin 7. Available from: 8 https://mb.com.ph/2018/05/13/docquity-app-now-available-for-local-medical-professionals/. Last updated: May 13, 2018, cited Feb 10, 2021.
19. Garman JC. COVID-19: turning a pandemic into a learning opportunity for senior medical students. Int J Med Students. 2020 Sep-Dec;8(3):307-308.

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Experience

Deprived of the Sea: Being a Kenyan Final-year Medical Student During the COVID-19 Outbreak

Innocent Wafula,[1] Eunice M. Ong'era.[1]

The Experience

"If we continue to behave normally, this disease will treat us abnormally." This statement by the Cabinet Secretary for Health in Kenya on March 22, 2020,[1] nine days after the confirmation of the first COVID-19 case in Kenya, marked the beginning of months of never-ending uncertainties. The Kenyan Government has since worked tooth and nail to stem the tide of the rising number of cases in the country. Social distancing, travel restrictions, regional lockdowns, and curfews all have been implemented at some point to curtail the spread. However, five months down the line, the war seems far from over; the country is still experiencing an exponential increase in the number of cases and fatalities from the disease. As of August 15, 2020, Kenya had a total of 26,334 confirmed COVID-19 cases and 465 fatalities.[2]

We have witnessed the impact of the disease in Kenya go deep, beyond fever, dry cough, breathlessness, sore throat, and anosmia. It has left the country's economy hamstrung; the education sector inclusive. Just two days after the first case was reported (March 15, 2020), the government issued directives for the closure of all learning institutions. Millions of students have had their education disrupted. Online platforms have since been the dominant alternative platform for education, just like in other countries such as Italy[3] and the United States,[4] which were among the first to report upsurges of the infection. However, in a situation where most students barely have stable access to the internet and electricity, online education has been a source of inequalities in education that disadvantages the socio-economically underprivileged.

For final-year undergraduate medical students, our journey in medical school has been anything but simple. Although the Kenyan medical education system involves six years of undergraduate study, the study period for our class has been extended by almost a year due to various external interferences, including industrial actions by lecturers and doctors. COVID-19 has yet been another interference. Barely three months shy of achieving our much-anticipated lifetime goal; the proclamation of our graduation, the classic head-to-head classes were halted. A bitter pill to swallow indeed. The adoption of online classes shone a ray of hope in our disconsolate hearts. Initially, it was exciting, being a new experience for most of us. Who wouldn't enjoy classes at the comfort of their home where the soft chair is more lenient to the gluteus than the school bench? Although the online platforms robbed us of the experience of physical interaction with our teachers, interacting with colleagues, working with peers and the sense of group solidarity among us, it did save some of us the embarrassment of raising face to face questions. It even provided a platform for some of the very shy of us (or those with the "purulent stuff" kind of questions) to type them on our keyboards. It gave us a rare chance of doubling up attending class while spending time with our families, which we hardly do with the busy schedules at medical school. With the extra time at hand, some of our colleagues even had an opportunity to study more and catch up on the areas that they had lagged behind, at least initially.

Nevertheless, the experience came with challenges. To put it into perspective, our school is in Nairobi, the epicenter of the pandemic in Kenya. Immediately after the closure of school, I (the first author) travelled 200 miles by road to home in Kakamega. Here, there is no broadband or fiberoptic connection, and I heavily rely on mobile network providers for internet access. Even so, the mobile network coverage is not strong enough, and the most stable mobile network that I can use to access online classes is the most expensive. On average, I spend KES 100 (approximately $1 USD) on internet bundles to attend classes and access learning material for the day, which is of course a costly out-of-pocket expenditure for a student without a stable income. Besides episodic interruption of electricity is a norm; there was even a time when I lacked electricity for five consecutive days. Notably, such challenges are comparable to those experienced by medical students in other low- and middle-income countries (LMIC) such as Nigeria[5] and India.[6] Despite such setbacks, our class did not tire. We pulled out all the stops to ensure everyone's progression, including conducting a small fundraiser to support colleagues who would have trouble affording the internet. More so, just like in Italy,[7] lectures were even recorded for future reference or access to those who could not attend the live sessions.

Classes have never replaced the clinical practice in medicine. To quote Sir William Osler, "He who studies medicine without books sails an uncharted sea, but he who studies medicine without patients does not go to sea at all."[8] Unlike medical students in such countries as Thailand where Samuthpongtorn & Pongpirul reported having had the experience of seeing patients in the midst of the pandemic,[9] we were deprived of the sea from the beginning. Justifiably, it would be hazardous to have us in the hospitals in the middle of an outbreak of a novel, highly infectious virus and a widespread shortage of personal protective equipment. Nevertheless, the essence of medical education is not to graduate, but to graduate when competent to provide patient care. We can only do so with adequate exposure to the clinical environment. Qarajeh et al. suggest that exposing medical students to the clinical environment during this period would improve their insight into their practice of medicine especially in periods of crisis, and they even endorse returning of US students to training after receiving infection prevention training.[4] Is this an option for us? Is there room for online examinations and graduation as reported in the Italian medical students' experience?[7] Is it applicable in our setting? What will happen to those who cannot access the online examination platforms? What about our clinical experience? No one wants to be referred to as the 'COVID-19-generation of medical graduates who lack basic clinical

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skills.' The uncertainties are many. Yet, it is the general wish of the final-year class to complete our education and join other healthcare workers in the country in providing care.

Indeed, the uncertainties have created fear, anxiety, and despair, more so among medical students. Yet, we should not lose sight of the future. At the moment, perfect the art of watchful waiting and maintaining safety. The future is guaranteed if we are safe enough to experience it. Setbacks are just setups for comebacks.

References

1. Ministry of Health. Kenya reports eight more cases of Coronavirus. Available from: https://www.health.go.ke/kenya-reports-eight-more-cases-of-coronavirus/. Last updated August 5, 2020; cited Aug 15, 2020.
2. Worldoemeter. Kenya: Coronavirus. Available from: https://www.worldometers.info/coronavirus/country/kenya/. Last updated August 15, 2020; cited Aug 15 2020.
3. Biavardi NG. Being an Italian medical student during the Covid-19 outbreak. Int J Med Students. 2020 Jan-Apr 2;8(1):49-50.
4. Qarajeh R, Tahboub F, Rafie N, Pirani N, Jackson MA, Cochran CD. The Effect of COVID-19 Pandemic on US Medical Students in their Clinical Years. Int J Med Students. 2020 May-Aug;8(2):172-4.
5. Adebisi YA, Agboola P, Okereke M. COVID-19 Pandemic: Medical and Pharmacy Education in Nigeria. Int J Med Students. 2020 May-Aug;8(2):162-4.
6. Chatterjee S. The COVID-19 Pandemic Through the Lens of a Medical Student in India. Int J Med Students. 2020 Jan-Apr;8(1):82-3.
7. Pagano G, Luglio G. Medical Education in Naples, Italy, at the Time of SARS-CoV-2. Int J Med Students. 2020 Jan-Apr;8(1):51-3.
8. Osler W. Aequanimitas: With Other Addresses to Medical Students, Nurses and Practitioners of Medicine. Philadelphia, PA: P. Blakiston's Son & Co.; 1904. Books and men; pp. 217–26.
9. Samuthpongtorn C, Pongpirul K. Medical Students in Low-and Middle-Income Countries and COVID-19 Pandemic. Int J Med Students. 2020 Apr 30;8(1):79-81.

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Experience

The Vigil of Medicine

Kiersten Kelly.[1]

The Experience

We were two fourth year medical students who poked our heads out of the tent at 2:00 am. The stars shone brightly and cascaded through our peripheral vision. We were at 12,000 feet elevation and had 2,000 more feet to climb before sunrise. We did all of the preparation we had done so many times before – boiled water for a couple packets of oatmeal, dressed in layers, checked and rechecked that we had everything. We flipped on our headlamps and began our ascent.

Up and up we went, our breath becoming short and our legs fatiguing with the decreased oxygen. It was completely dark except for the small halo of light provided by our headlamps, so we couldn't see where we had come from or where we were going, the cliffs that we were skirting or the rise in mountains beside us. We were just walking, up and up, blindly following the path that so many had taken before.

Every once in a while, we turned around and saw the glow of headlamps that snaked up the mountain, curving with the switchbacks. Each individual was on their own journey, up the tallest peak in the contiguous United States, but at the same time, we were doing it together, walking the same path, striving towards the same goal.

The last quarter of a mile was the most challenging. My quadriceps burned with every step, my hands were numb, and I couldn't find my breath. The faint glow of light behind the mountains now revealed the silhouetted peak we were ascending. The view was already beautiful. I turned to my friend and asked, "Do we have to go all the way?"

She simply said, "Yes," and we kept going.

As we were about to summit, an older gentleman was already on his way down. He told us we wouldn't be able stay for long because the wind at 14,508 feet would cut through our layers of clothing. He was right. Once on top of the giant boulders that comprise Mt. Whitney, we spun around and took in the vast expanse of surrounding mountains and valleys before we started our descent, already preparing for the next passes we would encounter. This was Day 4 of our 21-day backpacking trip to complete the John Muir Trail, which for us totaled 250 miles, ranging from Mt. Whitney in the south to Yosemite in the north. Our journey was just beginning.

The moments when I turned around and saw the line of headlamps in the clear night as we ascended the highest peak resonated with me profoundly. It looked like a vigil up the mountain and I immediately thought of the path of medicine: we follow a trail and can't always see where we are going or how difficult it is going to be. People have been there before and more will come after, each generation of new providers following in the same footsteps but making them their own.

I was also reminded that the journey of medicine is one fraught with challenges. Before the COVID-19 pandemic, the pressure on physicians was already incredibly high, and more providers were experiencing emotional and physical exhaustion along with burnout, resulting in an estimated 400 physician suicides each year.[1] Among medical students, burnout has also been shown to develop over the course of training, with emotional exhaustion increasing substantially after starting clinical clerkships.[2] Personally, there were times during my training when I did not know if I would be happy in this profession. I had spent so long studying and working that all of a sudden, it very much felt like a trap. If I was exhausted after a day in the hospital or clinic as a medical student, I asked myself – how would I make it through residency when my workload and responsibilities would increase exponentially? I wondered if all it took was one misstep on the trail before I hurdled down the mountain towards inevitable burnout.

Then I remembered that I am not alone on this vigil. Residents and practicing physicians continue their journeys because they know medicine is not one peak or one diploma, but rather thousands of steps through many summits and valleys. I remember that despite the stress and the toll of this path, medicine is the most meaningful way that I could spend my life. I am inspired by my colleagues and mentors who have each chosen to put the lives of others in front of their own. I am inspired by my patients who, despite all of the barriers, showed up to receive care or who are pushing through some of the most difficult experiences of their lives.

To the newer medical students, welcome. You are part of the vigil, the string of headlamps that snake up the mountain, the journey that you will take one day, even one heavy step at a time, in the pursuit of science, empathy, and better health for our communities. Sometimes, particularly when the trail is intimidating or even isolating, it is better to focus on the small halo of light in front of you. Take comfort in knowing that many have passed before you but that it is simultaneously your own climb, your own struggle against your mind, your body, and the flood of life paths you suddenly realize you could be walking instead. Also, do not be afraid to take a moment to look behind you. Already there are more people with headlamps wishing they were in your shoes. In the 2019-2020 academic year, over 53,000 applications were submitted to United States medical schools, and just under 22,000 students matriculated.[3] Take a deep breath, find your shooting star, and remember that you have been training your whole life for this journey and the ascents to come. Hold onto the strength of your first steps and the reasons you started. I hope you never underestimate the importance of a nutritious breakfast, supportive shoes, and a good friend who encourages you to keep going. The climbs are worth it.

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References

1. Stehman CR, Testo Z, Gershaw RS, Kellogg AR. Erratum: This Article Corrects: "Burnout, Drop Out, Suicide: Physician Loss in Emergency Medicine, Part 1". West J Emerg Med. 2019 Aug 21; 20(5):840-1.
2. Hansell MW, Ungerleider RM, Brooks CA, Knudson MP, Kirk JK, Ungerleider JD. Temporal Trends in Medical Student Burnout. Fam Med. 2019 May;51(5):399-404.
3. Association of American Medical Colleges. 2019 FACTS: Applicants and Matriculants Data. AAMC; 2019 Available from: https://www.aamc.org/data-reports/students-residents/interactive-data/2019-facts-applicants-and-matriculants-data. Published October 28, 2019. Accessed September 28, 2020, cited 2020 Sep 28.

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IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Experience

Hurricane Kids: Impact of Socioeconomic, Public Health, Medical Education, and Natural Disasters on a Doctor in Training

Kate Young.[1]

The Experience

My first year of residency would have been complete by July 2021 if the COVID-19 pandemic did not cause shutdowns of hospital clerkships, United States Medical Licensing Exam (USMLE) centers, and subsequent major revision of national licensing mandates. If I could measure impact of adverse life events by Saffir-Simpson hurricane scale[1], I would grade this setback at the end of my medical school journey as the lowest (Category 1) and the one at the beginning as the highest (Category 5). Having your plans derailed by circumstances outside of your control feels different when you are fighting your battles alone or when the harm is not done by someone you trusted unconditionally. The excitement of medical school acceptance news faded the day my child and I found ourselves in a state of emergency. Everything we had was gone in an instant without a warning; everything had to be rebuilt from ground zero going forward. A family member seized our savings and belongings, cancelled credit cards, and locked us out of the home we owned. An investigation was started, but as a sole immigrant with my support network left behind in my home country, I had no one to turn to for help.[2] Nonetheless, I was determined not to let another person's duplicity obliterate my dream of becoming a doctor and asked the Dean for deferment. I cut my premed classes short, secured a job, hired an attorney to file for divorce and to recover stolen assets, moved into a new house, and applied for a student loan. A year later I was in Dominica for my white coat ceremony. A doctor once told me that they call us Caribbean medical school graduates 'hurricane kids' and I recall wondering what he meant by that.

Dominica is an island in the Lesser Antilles known for its pristine landscapes (See ***Figure 1***), hurricane history, and high per capita incidence of centenarians.[3] It has claimed the world's oldest citizen,[4] Ma Pampo Israel, who passed at the age of 128. While Dominicans thrive in their surroundings,[5] I was substantially impacted by their microworld of multidrug-resistant Pseudomonas aeruginosa, Helicobacter pylori, and mosquito-born viruses.[6] I grew up in Russia and made it through the era of rationed food, held-back wages by corrupt politicians, and frequent power and water outages. However, the public health policy was robust and proper healthcare was accessible to all. I learnt to function in an under-resourced environment, but although I like to think I have a strong immune system considering my extensive worldwide travels, I still succumbed to tropical heat and poor sanitation.[7,8] Dengue fever confined me to bed for 2 weeks in the first semester of my academic year. My first ear infection assumed a chronic state and progressed to malignant mastoiditis in the third semester. Bouts of gastroenteritis and dysentery led to hypovolemic shock and hospitalization in the fourth semester, and the ensuing peptic ulcer required 4 trials of triple antibiotic therapy. The second-year of learning was further enhanced by the hurricanes. I lived through the aftermath of the tropical storm "Erika" which has left 30 people dead, and the rest of 17,000 without electrical power and drinking water for months.[9] We were evacuated to a nearby island and then returned to Dominica to partake in the international aid efforts treating traumatic injuries and opportunistic infections. Two years later, Hurricane "Maria" caused the deaths of 3,000 Puerto Rican and 65 Dominican individuals and rendered 85% of Dominican population homeless.[10] At this timepoint, the administration quit restoration efforts and relocated the campus.

Figure 1. Dominica, the Nature Island. Hurricane kids on treacherous expedition to the Boiling Lake. Like my medical school journey, the view from the top of the dormant volcano was worth the climb.

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I was looking forward to the peace and comfort of familiar surroundings as the next two and a half years of school were scheduled to take place in Florida, USA. Unfortunately, my return home was not as peaceful as I had hoped. I was pulled into a child custody litigation and had to defer my clinical rotations. We subsisted on student loans and could not afford an attorney, so fighting for my son's well-being 'pro se' turned into a full-time job. In the end, even the petition to relocate with a minor was denied. With nothing more to lose, I moved across the state to resume school and then drove 10 hours every other weekend to take care of my son. I was chronically exhausted and sleep-deprived[11] but I focused on my dream and made time to engage in research and present my findings at medical conferences. I received honors in my core clerkships, published my research, and passed the board exams. When the Florida governor issued a state of emergency in the face of approaching tropical storm "Irma", I calmly evacuated to Georgia. I stopped wondering about the meaning of 'hurricane kids' a long time ago; it is an epithet describing young adults whose resilience and compassion had been elicited and magnified by surviving disasters. I spent countless hours in classrooms, libraries, labs, and hospitals working hard to become what my Dean's Letter qualifies as 'an excellent physician', yet I do not owe my quality as a doctor to textbooks and question banks; I owe it to taking chances and learning from my experiences.

A year into the pandemic, travel and social gatherings are still forbidden, the death toll continues to rise, and politicians on television explain away the pervasive chaos with mantra of "unprecedented times".[12] People ask me 'When is this going to end? They say to me "You are the doctor, you should know". What I do know is that 'social distancing' is not nearly as hard as 'social isolation' and that there is abundance of destitution in the world. I know the rigor of the medical school curriculum is real, and the demand for grit does not end after a trauma surgery rotation, USMLE exams, or a viral pandemic. None of it gets better with time; we-human beings-get better at facing challenges. Resilience and compassion are best forged in the heat of the real world. For a word of comfort to sound genuine, for a treatment plan to be reasonable, for a patient to believe in it and remain compliant with it. It is incumbent on us as physicians to cultivate these qualities early in our careers in order to help other people trapped in an ailing body, or a bad socioeconomic situation.

These are 'unprecedented times' for the medical education as well.[13,14] As the USMLE Step 1 was demoted to pass/fail and Step 2 CS was annulled altogether, medical students were freed from subjecting their lives to chasing an anonymous score at the expense of mastering a very multifaceted field of medicine and serving the community. Explore, lead, advocate, turn negatives into a positive, and you will learn to truly heal others.

References

1. Federal Emergency Management Agency. SLG 101: Guide for All-Hazard Emergency Operations Planning: Hurricane, p.6-D-1. Available from: https://www.fema.gov/pdf/plan/6-ch-d.pdf ; cited 2021 Mar 08.
2. McLeod JD, Kessler RC. Socioeconomic status differences in vulnerability to undesirable life events. J Health Soc Behav. 1990 Jun;31(2):162-72.
3. US Department of State. Dominica. Available from: https://2009-2017.state.gov/outofdate/bgn/dominica/121269.htm; updated 2015 Nov 10; cited 2021 Mar 22.
4. Fineman M. An island discovers a treasure. Los Angeles Times. 2000 Mar 07; archived ed. Available from https://www.latimes.com/archives/la-xpm-2000-mar-07-mn-6245-story.html
5. Schnitter R, Verret M, Berry P, et al. An Assessment of Climate Change and Health Vulnerability and Adaptation in Dominica. Int J Environ Res Public Health. 2018 Dec 28;16(1):70.
6. World Health Organization. Worldwide country situation analysis: response to antimicrobial resistance, 2015. Available from: https://www.paho.org/en/node/63913 ; updated 2015 Apr 15; cited 2021 Feb 3.
7. Levy SB, Marshall B. Antibacterial resistance worldwide: causes, challenges, and responses. Nat Med. 2004 Dec;10(12 Suppl):S122-9.
8. Angelo KM, Haulman NJ, Terry AC, et al. Illness among US resident student travellers after return to the USA: a GeoSentinel analysis, 2007-17. J Travel Med. 2018 Jan 1;25(1):10.
9. Dominica: Tropical Storm Erika - Emergency appeal operations update no. 2 (MDRDM002). International Federation of Red Cross And Red Crescent Societies (Report). ReliefWeb. 2016 Jan 21. Available from: https://reliefweb.int/sites/reliefweb.int/files/resources/MDRDM002eu2.pdf; cited 2021 Mar 09.
10. Hurricane Maria. Wikipedia. Available from: https://en.wikipedia.org/wiki/Hurricane_Maria#cite_ref-1834_Dominica_hurricane_4-0; cited 2021 Mar 09.
11. Popay J. Being a woman is hard work: the policy implications of poor health among lone mothers. J Epidemiol Community Health. 1999;53(12):749.
12. Major C. Unprecedented Times and Innovation. Innov High Educ. 2020 Oct 23:1-2.
13. Boulet JR, Pinsky WW. Reporting a Pass/Fail Outcome for USMLE Step 1: Consequences and Challenges for International Medical Graduates. Acad Med. 2020 Sep;95(9):1322-1324.
14. Murphy B. USMLE Step 2 CS canceled: What it means for medical students. American Medical Association. 2021 Feb 04. Available from: https://www.ama-assn.org/residents-students/usmle/usmle-step-2-cs-canceled-what-it-means-medical-students

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IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Experience

Cultural Placement: My Experience in a Remote Fly-in Indigenous Community in Northern Ontario, Canada

Sebastian R. Diebel.[1]

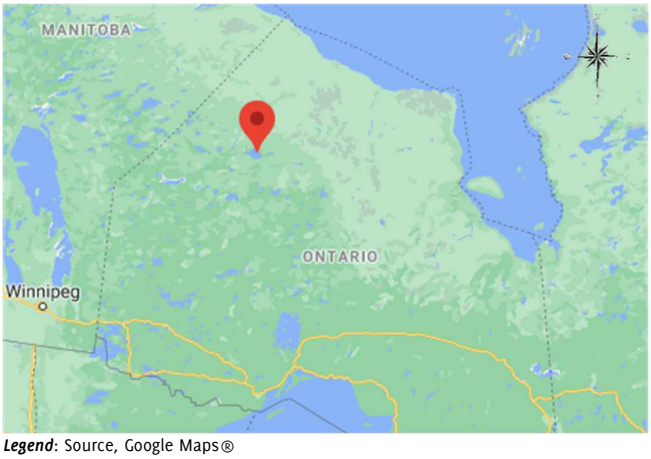
The Experience

Northern Ontario (NO) is a geographically vast land that is located in the province of Ontario in the country of Canada. In order to provide perspective, it is the size of Germany and France combined, yet possess a comparatively minute population of 840,000 people.[1] The Northern Ontario School of Medicine (NOSM) was created in 2005 and was the first new medical school created in Canada in over 30-years.[1] The school was created using a unique approach that involved engaging community stakeholders with the key concept of social accountability in mind.[2] Social accountability as it pertains to medical schools is the idea that the medical institution has an obligation to direct the education, research, and services that they are instructing towards addressing the needs of a community, region, and nation that they are serving.[2] The social accountability mandate highlighted the importance of serving the population of NO, including Francophone (individuals who speak French) and Indigenous populations. Indigenous populations represent approximately 4.4% of the population of Canada, however, when looking at a NO context the population is approximately 23% in the Northwest and 11% in the Northeast regions of Ontario.[2] As a result, NOSM, in collaboration and partnerships with Indigenous stakeholders created an Indigenous health curriculum that involves didactic learning, as well as a mandatory cultural competency placement for a one-month period of time in an Indigenous community that takes place at the end of the first year of studies.[3] The following is my experience of a one-month cultural competency placement in the Oji-Cree community of Kitchenuhmaykoosib Inninuwug (KI) First Nation, also known as Big Trout Lake in English (***Figure 1***). The First Nation of KI is a remote community that has a population of approximately 1200 people. The community is located south of the Hudson Bay on the shores of Big Trout Lake and does not have road access.[4]

After an entire day of travel, my classmate and I were sitting on a small airplane looking down into the vast landscape of NO. As we began to approach the First Nation community of Kitchenuhmaykoosib Inninuwug various thoughts were going through my head. Although I was familiar with some First Nation communities, I had never been to an Oji-Cree community. As a result, I sat pondering. What would the community be like? What language would people be speaking? What are the health needs and challenges of this community? Before I knew it, we had landed on the dirt runway and had arrived in Kitchenuhmaykoosib Inninuwug.

After we landed, we were able to find a community member to drive us from the airport to our accommodations, a modest little building that was not far from the community school. Shortly after we established our rooms, we did not have any direction as to what our next day would look like. The following day, we woke up, attended our distributed learning session, and shortly after presented ourselves to the community nursing station. Although the nursing station was not expecting us, they quickly made us feel at home. We were integrated into the operations quickly. This involved speaking with doctors who locum in the area, attending appointments with patients, and performing procedures such as phlebotomy, obtaining vital signs, and shadowing physicians during medical appointments. As a first-year medical student this was the first patient contact that I had experienced in the role of medical student. It is interesting to note that the first patient interactions I had in my medical school career may also be the most unique in both a cultural and rural manner. Culturally, I was exposed to a wide range of patient preferences. Some patients were open to Western medicine, whilst others were more hesitant and preferred some traditional methods of healing. From a rural standpoint, it is of note that the nursing station did not have any diagnostic imaging available. This adds an entire new layer of complexity to the paradigm of care as patients need to board an airplane and go to the community of Sioux Lookout located 426 kilometers to the south. By observing the physicians and being a part of interactions, I gained an appreciation for the importance of a thorough physical exam and making difficult clinical decisions. As a person, it made me feel grateful for having lived in areas with easy access to medical care. As a student it made me eager to want to continue my studies and continue to learn more about medicine in a clinical context.

Figure 1. Map of Ontario Depicting the Location of Kitchenuhmaykoosib Inninuwug First Nation.



Legend: Source, Google Maps®

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Outside of medicine, we were able to spend time with community members and learn about the culture and traditions of the community. Personally, I found the distribution of language to be interesting as it appeared to me that the elders in the community almost exclusively spoke Oji-Cree, whereas the younger generation appeared to be fluent in both Oji-Cree and English. As we were not from the community, some community members were curious as to who we were and what we were doing there. The curiosity quickly led to members being friendly and welcoming. Some members were excited that we were present and insisted that they show us around their community. They were very proud of the community and what it had.

Although the crux of this placement was of a cultural nature, my classmate and I were able to participate in a pan-community Hepatitis screening project with a PhD researcher from the University of Toronto (***Figure 2***). My involvement in this activity afforded me the opportunity to understand medicine from a cultural point of view that I had never experienced before. I had discussions with individuals that had a completely non-western view on medicine and preferred to speak in heir Oji-Cree language. To me this was an experience that I will remember and take with me for the rest of my medical career. I particularly found it interesting that many participants stated to myself and the team that they attended because it was asked of them to benefit their entire community. Their Chief and Council had requested for every individual to be tested for the safety of the community and almost everyone complied, even if they personally may not have benefited, as they knew it was best for their community. I found this to be very interesting and it was explained and apparent to me that everyone coming together for the benefit of the entire group, a collectivist ideology, was very much ingrained within the culture. I believe this cultural ideology of collectivism can be transferred to the larger exterior population and it made me want to think more about the importance of global and public health with the need to benefit the many and not just the few.

The experiences that I gained during this cultural competency placement were extremely unique and advantageous in keeping with the spirit of reconciliation.[5] Although there is still much work to be done, Canada has recognized the injustice that Indigenous peoples have faced. Currently, attempts towards reconciliation between the Government of Canada and Indigenous populations are underway.[5] I am pleased that I attend a school that works in the spirit of reconciliation.

Figure 2. Me Assisting in the Pan-Community Screening Event.

I thoroughly enjoyed my placement in the Oji-Cree community of Kitchenuhmaykoosib Inninuwug. I gained insight and perspective that involved feeling humbled and thankful, all of which was done in the spirit of reconciliation. The transferable lessons for both myself and the broader medical community involve the need to remain culturally sensitive and humble in order to best serve Indigenous communities. This is particularly true for anyone studying medicine in countries with colonial legacies such as Australia, Canada, and the United-States.[3]

I am fortunate to attend a school that is rooted in social accountability and has a strong desire to improve the health of the various populations it serves including Francophone and Indigenous populations. I have taken life-long lessons with me and I believe that students who wish to serve Indigenous populations should spend time during their formative training to understand the intricate cultural workings that are at play. This is an experience that I will take forward through the remainder of my medical journey.

References

1. Strasser RP, Lanphear JH, McCready WG, Topps MH, Hunt DD, Matte MC. Canada's new medical school: The Northern Ontario School of Medicine: social accountability through distributed community engaged learning. Acad Med. 2009 Oct;84(10):1459-64
2. Strasser R. Delivering on social accountability: Canada's Northern Ontario School of Medicine. The Asia-Pacific Scholar. 2016;1(1):1-6.
3. Jacklin K, Strasser R, Peltier I. From the community to the classroom: The Aboriginal health curriculum at the Northern Ontario School of Medicine. Can J Rural Med. Fall 2014;19(4):143-50
4. Peerla D. No means no: The Kitchenuhmaykoosib Inninuwug and the fight for Indigenous resource sovereignty. Available at SSRN 2189897. 2012 Dec 15.
5. Niezen R. Truth and indignation: Canada's Truth and Reconciliation Commission on Indian residential schools. University of Toronto Press; 2017 Nov 15.

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Experience

COVID-19: Not a Positive Test Result, but a Positive Outlook

Jae H. Yoo,[1] Nathaniel P. Mercer.[2]

The Experience

The year 2020 has been nothing short of terrible, leaving society in a state of quandary successfully putting a foothold for many years to come. Indeed, it is no secret that the world has been anticipating the end of a treacherous year. As the year 2021 commences, collectively, we have welcomed this New Year with higher hopes and optimism like never before.[1] The series of events that occurred in 2020 — a nerve-racking Presidential election in the United States and intense wildfires in Australia, to name a few, while egregious on their own accord, seemingly appear minute compared to the worst of all: COVID-19.[2] The RNA virus that stood out amongst its own kind led to a worldwide shut down leaving millions without work.[3] Despite what seems like a scene from the movie Contagion, 2020 was not without silver linings. You just have to look for it.

"Now more than ever we need your talent, your energy, your resolve and your character," said Dr. Fauci to new medical graduates at the height of the pandemic.[4] Dr. Fauci's words encapsulated a nation-wide push for more physicians and healthcare workers to assist on the frontlines as we battled a truly unprecedented virus. As a result, medical school applications have risen nearly 18%, which is truly uncharted territory.[4] We believe that the spike in medical school applications can be seen as a diamond in the rough, metaphorically representing a positive outcome from the COVID-19 pandemic. It is easy to focus on what was lost during this year, but we should have high hopes for the future, as people have been inspired and motivated to learn more about medicine and contribute to the overall health of society with the intentions to prevent a COVID-type situation from ever catching us flat-footed again in our lifetime.

It was a year to reconnect with things that we lost over time. All over social media, families and friends stuck in quarantine together used this time to escape to the kitchen and subsequently turned it into a bakery. There were stories that, despite not making the front page, warmed the hearts of millions — "Quarantine saved my marriage". Once a lost form of communication, especially among the millennial generation, phone calls became prevalent again, and with the help of Zoom, virtual "drinking" ensued. Moreover, as a society, we began to utilize and focus on what we had rather than delving into what we want. Some would argue that we had no choice, but we believe this was a prime example of humanity demonstrating resilience and adaptability in the face of adversity. Board games and puzzles allowed us to channel our inner-childhood again, while kettlebells and tension bands kept our mind-body connection tethered just long enough to outlast a nation-wide shutdown. Once the world completely opens up its arms to society again, it will be interesting to see how people readjust to the 'new normal'. Some may feel reluctant to assimilate back into old patterns and the old way of life for fear of COVID-19, but perhaps the majority will re-enter society with a new appreciation of life instead. Notably, COVID-19 appeared to have directly caused a reduction in CO_2 emissions.[5] With fewer cars on the roads and people working from home, there is less traffic congestion, which has resulted in an 8.8% drop in global CO_2 emissions when compared to the same period in 2019.[5] It is no surprise that when the world opens its arms to society again that our interests will likely shift back to what consumed our former minds but it is also encouraging to hope that perhaps we can see people playing chess in parks again.

The devastating losses we have endured this year will forever leave a hole in our hearts. The racial injustice we continue to face rages on. However, 2020 has left us with room to breathe. With a tumultuous year behind us we can now strive to enact everlasting change for the betterment of society. We have neglected the culture and ways of life of others for years. The malicious events of the year 2020 opened our eyes to such atrocities which will hopefully result in strides towards inclusion and unification rather than disassembly. Xenophobia against Asian Americans as a direct consequence of COVID-19 was at an all-time high.[6,7] In spite of this, *Parasite* won the Oscar for best picture — a first for an international and Korean film. The Bangtan Sonyeondan craze continued globally and was featured as *Time* Magazine's 2020 Entertainer of the Year.[8] Moreover, history was made when the United States saw its first woman of color and Asian American Vice President, Kamala Harris, elected amid the Black Lives Matter protest. Collectively, the public marched the streets for a singular movement to combat racial and LGBTQ discrimination in hopes for a better future for all. In May 2020, Crayola announced its release of a new set of crayons that will allow children to better reflect the world.[9] Despite COVID-19 placing the spotlight on the atrocities that are still prevalent in today's society, we must ride the momentum of the major movements for racial and LGBTQ justice through 2021 and beyond as we strive towards a better world.

Needless to say, 2020 was a whirlwind and will likely have its own chapter dedicated to the history books in the years to come. It was not a year to check things off of a bucket list. Instead, it was a year to count our blessings and find value in simple things; baking banana bread, connecting with friends and family, being fully present, and realizing how short life is. It was a year to be grateful for all we have and knowing that is simply enough. It was also a year that may serve as a catapult into a more progressive, accepting, and promising world for medicine and humankind alike. The year 2020 was not easy, so remember to commend yourself for making it this far.

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References

1. Bonilla-Escobar FJ, Kumar AA, Farrugia-Bonnici G, Ryan PM, Găman M-A. A Grain of Sand in the Ocean: Training New Generations of Editors, Reviewers, and Medical Scientists. Int J Med Students. 2020 Sep-Dec;8(3):213-6.
2. Williams DR, & Medlock MM. Health Effects of Dramatic Societal Events — Ramifications of the Recent Presidential Election. N Engl J Med. 2017 Jun 8;376(23):2295-9.
3. Anwar H, Khan QU. Pathology and Therapeutics of COVID-19: A Review. Int J Med Students. 2020 May-Aug;8(2):113-20
4. American Medical Association. Applications to medical school up big: Is it the "Fauci effect"?. Available from: https://www.ama-assn.org/residents-students/preparing-medical-school/applications-medical-school-big-it-fauci-effect. Last updated December 18, 2020; cited Jan 1, 2021.
5. Liu Z, Ciasis P, Deng Z, Lei R, Davis SJ, Feng S et al. Near-real-time monitoring of global CO2 emissions reveals the effects of COVID-19 pandemic. Nat Commun. 2020 Oct 14;11(1):5172.
6. Ngo HG, Gibney BL, Patel P, Nguyen JL. COVID-19: Using Social Media to Promote Mental Health in Medical School During the Pandemic. Int J Med Students. 2020 Sep-Dec;8(3):305-6.
7. Ho CP, Chong A, Narayan A, Cooke EA, Dang F, Agrawal V, et al. Mitigating Asian American Bias and Xenophobia in Response to the Coronavirus Pandemic: How You Can Be an Upstander. J Am Coll Radiol. 2020 Dec 17;(12):1692-4.
8. US News and World Report. Time Magazine Names BTS Its Entertainer of the Year. Available from: https://www.usnews.com/news/entertainment/articles/2020-12-10/time-magazine-namesbts-its-entertainer-of-the-year. Last updated December 10, 2020; cited Jan 2, 2021.
9. Breaux, H. Editorial: Crayons and People are not for Consumption: A Social Work Discourse on Crayola's New Box. Child Adolesc Soc Work J. 2020 Aug 1;37:459–61.

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Experience

Coping Strategies for Medical Students During the Pandemic: A Nigerian Perspective

Toluwalashe Soyemi.[1]

The Experience

SARS-CoV-2 (COVID-19) was declared a pandemic on March 12, 2020 by the World Health Organization (WHO).[1] For many medical students in Nigeria and all over the world, it was clear that there was about to be a major shift in the upcoming months, not just in the academic community, but also in our everyday lives. While anxiously waiting, the first cases were identified in Lagos, Nigeria in late February 2020.[2]

In Nigeria, the medical curriculum is intensive with very little time reserved for breaks and holidays. For example, in my last 4 years of being a medical student in a state-run institution, the only major official breaks we received have been for public holidays. After exams, there is no official break and students resume classes almost immediately.

Soon schools, banks and other major institutions were shut down and the first lockdowns were imposed in Nigeria.[3-4] It was therefore no surprise that there was a strange combination of relief - from the exhausting work at medical school; and fear of what was coming next. Ideally, the average medical student in Nigeria attending a public academic institution spends more than the initial 6 years in university. This is due to a number of reasons including 'academic staff strike' and accreditation issues. Since the time in school would therefore be prolonged, the initial thought of students was that this indefinite break should be put to best use. During this time, medical students' concerns were mostly related to fear and anxiety, because of the incorrect information about the virus which has circulated online.

More than 6 months after this, medical students in Nigeria have developed several coping strategies in their respective ways of choosing how to spend their time. This classification of what medical students were doing is simply built on my personal experiences, as well as informal interactions with other medical students on their perceptions as to how they are coping during this pandemic.

On the third week of March 2020, The National Universities Commission declared all tertiary-level institutions to be closed down causing a halt in all academic activities.[3] Although plans were immediately made by some medical institutions to explore online platforms for academic engagements, the effectiveness of these platforms is still under scrutiny.[5] Nowadays, the break has made significant vicissitudes in the medical school curriculum. The effect of COVID-19 pandemic on medical students' education in Nigeria could therefore be considered significant, causing a disastrous effect on performance in examination post-pandemic and competency of the future healthcare professionals.[5] Even during this time, based on the interactions I had, several medical students have not totally neglected their academic responsibilities. For instance, many students like myself, are in the same position as a 4th year medical student in Lagos State University College of Medicine who were about to take their second professional exams, but these were postponed due to the pandemic. This break had been an opportunity for us to prepare more and focus fully for the upcoming exams. Others took up internships in local clinics in order to build professional experience and to perhaps help themselves during their clinical courses.

Many medical students have also taken this opportunity to contribute towards tackling the pandemic in their own way. Some have been volunteering in projects for community outreach & sensitization of the virus with the donation of relief packages including food items, face masks and sanitizers.[6] For example, since the pandemic onset, I have been supervising Protostar Initiative. This project provides free online mental health services (therapy and counselling) to women, girls and teenagers who have been affected by the pandemic, by connecting them to volunteer mental health professionals from the comfort of their own homes.[7] Medical students contributing towards social impact is not a surprise, as medical students all over the world have long been taking up initiatives to tackle problems; for example, the student-led International Federation of Medical Students Association (IFMSA) which is WHO-recognized partner and has led several projects contributing towards betterment of global health.[8] Evidently, when students are active in these groups, they develop skills such as advocacy, communication, public health campaigning, and the ability to work with multi-disciplinary teams.[8]

It is generally known that the medical curriculum plays a major role in preparing students to be professionals in their field of expertise. However, it plays a lesser role in helping students develop their potential and skills in areas of leadership, team collaboration, and advancements in the area of social impact. Using myself as an example, I have volunteered for different projects and worked with different organizations. This has helped develop my personal and professional skills over time. Knowing that the medical curriculum is insufficient, many students have taken this time to be more intentional about their growth, apart from the academia. Many are taking online courses, learning new languages and engaging with other sectors (businesses and other non-medical organizations). A handful of students has been engaged in research by publishing papers and articles, while others have read self-improvement books.

Medical students have leveraged their free time by building their capacities and professional growth. In fact, local medical associations have played a number of roles in this. Nigerian Medical Students Association (NIMSA) is the umbrella body of over 60,000 medical students in the 38 medical schools in Nigeria, is affiliated with IFMSA, and is the student arm of the Nigerian Medical Association. They have been key players in contributing to the capacity building and personal development of their members; both having organized shared learning

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opportunities such as research writing, accessing global opportunities and CV writing, for their members.

The medical curriculum is one that is quite intensive and so, not much leisure is given to medical students during their training. At these times, many students, especially those in their clinical training, have undoubtedly used this opportunity to spend more time involved with self-improvement plans such as research, volunteering, or reading. This has shown how medical students can be resourceful in times of crisis.

References

1. World Health Organization. WHO announces COVID-19 outbreak a pandemic. Available from: https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/news/news/2020/3/who-announces-covid-19-outbreak-a-pandemic; Last updated March 3, 2020; cited July 28, 2020
2. Nigeria Centre for Disease Control. First Case of Corona Virus Disease Confirmed in Nigeria. Available from: https://ncdc.gov.ng/news/227/first-case-of-corona-virus-disease-confirmed-in–nigeria. Last updated Feb 28, 2020; cited December 28, 2020.
3. Azeezat. Adedigba. Coronavirus: NUC announces closure of Nigerian universities. Available from https://www.premiumtimesng.com/news/headlines/382880-coronavirus-nuc-announces-closure-of-nigerian-universities.html. Last updated March 20, 2020; cited December 28, 2020
4. This Day. Lockdown Continues As Long As Necessary, Says Buhari. Available from: https://www.thisdaylive.com/index.php/2020/04/12/lockdown-continues-as-long-as-necessary . Last updated April 12, 2020; cited July 27, 2020
5. Adebisi Y.A, Agboola. P, Okerede M. COVID-19 Pandemic: Medical and Pharmacy Education in Nigeria. Int J Med Students. 2020 May-Aug;8(2):162-4.
6. The Nation. Scheme Empowers Lagos Slums against Covid-19. Available from https://thenationonlineng.net/scheme-empowers-lagos-slums-against-covid-19/. Last updated May 24 2020; cited December 28, 2020
7. Mariam Ileyemi. Protostar Initiative Makes Mental Health Service Easier. Available from: https://www.yossyinfo.com/protostar-initiative-makes-mental-health-service-easier/. Last updated June 22, 2020; cited September 25, 2020.
8. Singh S, McCool J, Weller J, Woodward A. Medical Education in the 21st Century: Students Driving the Global Agenda. Educ Res Int. 2012;2012: 1–5.

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Medical Electronic Devolution

Michael J. Olek,[1] Linsey Bui.[2]

The Letter

The hype in the 1980s promised that computers were going to make our lives easier. Computers and artificial intelligence (AI) were supposed to revolutionize medicine. In some areas they have: a 2019 article in Lancet Neurology detailed results showing "long-term activation of a 4- limb neuro-prosthetic exoskeleton by a complete brain–machine interface system using continuous, online epidural ECoG (Electrocorticography) to decode brain activity in a tetraplegic patient."[1] Having laboratory information and radiologic studies available at your fingertips is also a wonderful application of this technology, as is the ability for physicians to send most prescriptions electronically to a pharmacist, who can also now track patients digitally.

I graduated osteopathic medical school in 1989 and did not contend with computers for most of my training; the first publication from the Institute of Medicine on computer-based patient records was in 1991.[2] Cost was a prohibitive factor in early expansion of the electronic medical/health records, but as more hospitals came online, the Health Insurance Portability and Accountability Act (HIPAA) of 1996 was passed. As of July 2017, electronic health records (EHR) were being used by 86% of offices and 80% of hospitals had adopted a certified EHR.[3] Later, the Health Information Technology for Economic and Clinical Health Act of 2009 provided $27 billion of federal incentives, prompting doctors to quickly adapt to the EHR.

I can remember performing rounds in the hospital as a 3rd or 4th-year student; if there was an interesting case on another team, I went to the paper chart and read about the case. During my residency, computers were only used for placing orders and retrieving lab values. During my fellowship, computers advanced to a degree that we could look at radiological studies digitally rather than lugging several pounds of film from the radiology suite, if in fact the studies could be located. Later, as an attending, I would often admit patients to my service and leave the service before I knew the outcome from our initial assessment of the patient. I would keep the medical record numbers of these patients and in a week or so, I would look into their EHR to see whether my initial diagnosis was correct, what the treatment was, and how the patient responded. Technically, this was in violation of HIPAA policy, but seemed logical to someone wanting to learn more about medicine.

Fast-forward to 2019: were the wonderful advances of computers in medicine a success? A recent study in Mayo Clinic Proceedings gave the results of a research project from Stanford, Mayo, and the American Medical Association (AMA).[4] They surveyed over 5,000 physicians every 3 years on topics related to physician burnout. The burnout rate for physicians was 43.9% compared to 28.6% in the general population. The study also found that physicians spend 1-2 hours on medical records and paperwork for every hour spent with patients, and an additional 1-2 hours daily of personal time on medical records-related activities. The usability scale score went from a high of 93% for Google to a low of 45% for EHR, which gave it an "F" grade. The top 3 major causes of physician burnout were 60% for bureaucratic demands, 34% for long hours, and 32% for EHR. In terms of the EHR, the main contributors to the high burnout score were the emotional exhaustion score and the depersonalization score.

In addition, EHR data breaches are escalating. In a November 2019 article in The Guardian,[5] a Google employee became a whistleblower about medical data transfer wherein the company made a deal with Ascension Healthcare to have 50 million medical charts transferred to Google. Neither patients nor physicians were aware of the deal and the medical records were not de-identified, so not only was the medical data transferred but patients' names and addresses were also attached. In contrast, I was recently on a disciplinary board where a medical student was punished for looking into an EHR for a case in which he was not directly involved. As stated above, I have no problems with medical students or physicians reading other patients' medical records, as long as it is for medical education and not for personal gain or notoriety. It seems that if one person violates the medical privacy rights of a patient he is chastised and punished, but if a global multi-billion-dollar company with 114,096 employees violates the medical privacy rights of 50 million individuals, there are no significant consequences.

I know that we will never eliminate electronic health records and cases of people and/or companies downloading medical information for profit, but I would encourage medical students and physicians to stand up for medical education and have HIPAA reflect the positive aspects of accessing electronic medical records for educational purposes. In my opinion, there should be some legal reform to reflect the inadequacies of the electronic health record and the balance of the educational value to the medical student.

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References

1. Benabid AL, Costecalde T, Eliseyev A, Charvet G, Verney A, Karakas S, et al. An exoskeleton controlled by an epidural wireless brain–machine interface in a tetraplegic patient: A proof-of-concept demonstration. Lancet Neurol. 2019 Dec;18(12):1112-1122.
2. Ambinder EP. A history of the shift toward full computerization of medicine. J Oncol Pract. 2005 Jul;1(2):54- 56.
3. Stehman CR, Testo Z, Gershaw RS, Kellogg AR. Burnout, drop out, suicide: Physician loss in emergency medicine, part I. Western J Emerg Med. 2019 May;20(3):485- 494.
4. Melnick ER, Dyrbye LN, Sinsky CA, Nedelec L, Tutty MA, Shanafelt T. The association between perceived electronic health record usability and professional burnout among US physicians. Mayo Clin Proc. 2020 Mar;95(3):476-487.
5. The Guardian website/Anonymous. I'm the Google whistleblower. The medical data of millions of Americans is at risk. Retrieved from URL: https://www.theguardian.com/commentisfre e/2019/nov/14/im-the-googlewhistleblower-the-medical-data-of-millionsof-americans-is-at-risk. Last updated: Nov 14,.2019; cited Mar 14, 2021.

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Letter to the Editor

Providing Health Information on Social Media: What is the Limit for Medical Students?

Enrico Manfredini.[1]

Social media plays several important roles in medicine.[1] Doctors use Instagram®, Twitter®, TikTok®, and more to share successful stories and new treatments, and hospitals use social media to provide health information to patients. Medical students are important and influential participants in the digital world because they are young, they dominate social network resources, and they have high engagement power. How do medical students use their digital media abilities and knowledge to disseminate health information to patients and the general public, and what are the limits and best practices for them to share health information on these platforms?

There is an abundance of videos shared on social media of medical students at home or in a hospital setting. Some of these videos depict medical students presenting the most probable diagnosis for a given symptom, trying to diagnose skin conditions that others have shared with them, and reacting to people treating their conditions at home with non-evidence-based methods. In other videos, students list possible causes for relatively straightforward conditions such as constipation, acne, and nail abnormalities, and teach users how to treat them. These are some of the innumerous examples available from medical students and physicians.[2-5]

A potential issue related to posting health-related content is that medical students may be providing inaccurate information without a medical license or the legal right to practice medicine. Importantly, many of these videos do not include a recommendation to consult a physician, a warning against self-medication, or recommendations for additional research about a condition through official sources like health institutions and government websites.[2-5] Moreover, these disclosures and other recommendations are required to meet basic ethical and legal standards that are part of several social media guidelines for healthcare professionals,[1,6-7] including themes such as maintaining patient confidentiality, giving medical advice via a proper doctor–patient relationship, and more. The importance of these recommendations for sharing health information on social media have become particularly evident during the COVID-19 pandemic because some social media platforms detect posts about COVID-19 and recommend that users who view these posts visit healthcare authorities' websites for accurate information.[8] Failure to recommend official resources to users of social media may lead people to a delayed understanding of the condition and seeking medical assistance. For certain diagnoses, such delays can make a significant difference in prognosis.

Many social media posts and videos are intended to be entertaining, particularly in the new application, TikTok®.[2] Entertaining soundtracks and figures broaden the audience and present information in a straightforward manner; however, the light tone may lead patients to perceive symptoms and diseases as less serious than they are. For instance, constipation could be due to a relatively simple etiology such as a low-fiber diet, but it could also be the result of a severe and complex condition such as a gastrointestinal neoplasia.[9] Similarly, nail abnormalities could be caused by a micronutrient deficiency, but they could also be caused by chronic renal disease. [10] Such distinctions are most appropriately evaluated by professionals in a healthcare service environment rather than by patients or medical students on social media. Establishing a diagnostic hypothesis and resulting treatment is an intricate process best made in person by a professional. Therefore, social media users looking for information about a condition should be instructed to seek medical assistance rather than to self-medicate.

A factor that contributes to a deficiency in health information from social media is the brief nature of social media, including posts, one-minute videos, and "stories." Longer options exist but are less attractive to users because of the large quantity of information to scroll through. Similarly, social media users generally do not watch videos or read posts multiple times to make sure they have absorbed all the content. The brief attention span of social media users shapes the way in which content is structured and determines what information gets shared, including medical information. Notably, deciding what information to share is a problem that is not exclusive to social networks. For example, researchers who write an article about a study must carefully select what information to include, to respect the word count provided by the journal and preserve the content, which is not an easy task. The same challenge, but often to a greater degree, is encountered when creating online content because some ideas and cases cannot be expressed or discussed accurately in a brief time, hence some information always gets lost in translation to a public audience.

Medical students should carefully consider what information to share on social media and how to share it. Rigorous criteria must be applied, and students must take responsibility for the content provided as any healthcare professional would. One of the many benefits of social media is the ability to share information about a disease or condition with the general population in an accessible way. Social media can be used to raise awareness, combat misinformation, provide patient support, answer common questions, engage with patients, and more. However, no treatment, conduct, or medication should be recommended collectively or individually by medical students on social media other than instruction to consult a physician and not to self-medicate. In addition to this limit, it is essential for medical students to provide reliable sources of information for public reference. Students can provide internet sources in which the information has been filtered and simplified by experts in the field, such as WebMD®, Mayo Clinic®, or the Health Information portal of the National Institutes of Health (NIH).

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In conclusion, social networks are a significant source of medical information and will continue to be relevant in the future. They should not be disregarded as a source of medical information; however, the information shared and the ways in which information is shared must be regulated to ensure patient safety and protection. This regulation already exists to some extent, given that there are several guidelines on using social media for doctors and students available; however, these guidelines are not strongly implemented across institutions and most schools do not include them as mandatory in their curricula, leaving the door open for potential misuse and spread of misinformation. For example, schools could offer classes or information about how their students should conduct themselves if they are creating online content.

References

1. Ventola CL. Social media and health care professionals: benefits, risks, and best practices. P T. 2014 Jul;39(7):491-520.
2. Bruno CM. A Content Analysis of How Healthcare Workers Use TikTok. Elon Journal of Undergraduate Research in Communications. 2020 Fall;11(2):5-16.
3. CNN. Nurses and doctors are flocking to TikTok to crack jokes and lip sync. But are they eroding patients' trust? Available from: https://edition.cnn.com/2020/01/18/us/tiktok-doctors-nurses-trnd/index.html. Last updated: January 18, 2020; cited March 11, 2021.
4. Harrison B, Gill J, Jalali A. Social Media Etiquette for the Modern Medical Student: A Narrative Review. Int J Med Students. 2014 Sep-Dec;2(2):64-7.
5. MIT Technology Review. Doctors are now social-media influencers. They aren't all ready for it. Available from: https://www.technologyreview.com/2020/04/26/1000602/covid-coronavirus-doctors-tiktok-youtube-misinformation-pandemic/. Last updated: April 26, 2020; cited March 11, 2021.
6. American Medical Student Association. Social Media Guidelines for Medical Students and Physicians. Available from: https://www.amsa.org/2016/09/15/social-media-guidelines-medical-students-physicians. Last updated: n.d.; cited March 11, 2021.
7. Riley B. Social Media Highway Codes. 1st ed. London: Royal College of General Practitioners; 2013.
8. Instagram. Keeping People Informed, Safe, and Supported on Instagram. Available from: https://about.instagram.com/blog/announcements/coronavirus-keeping-people-safe-informed-and-supported-on-instagram. Last updated: March 24, 2020; cited March 2, 2021.
9. Müller-Lissner S. The pathophysiology, diagnosis, and treatment of constipation. Dtsch Arztebl Int. 2009 June 19;106(25):424-32.
10. Singal A, Arora R. Nail as a window of systemic diseases. Indian Dermatol Online J. 2015 March-April;6(2):67-74.

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Letter to the Editor

Letter to the Editor Regarding "Hypertension Awareness, Treatment, and Control in Mexico: An Opportunistic Medical Student-led Blood Pressure Screening Campaign – A Cross-Sectional Study"

Patricio García-Espinosa.[1]

I have read, with great interest and curiosity the article entitled "Hypertension Awareness, Treatment, and Control in Mexico: An Opportunistic Medical Student-led Blood Pressure Screening Campaign – A Cross-Sectional Study" by Yamamoto-Moreno, JA *et al.*[1] As the current leader of a special interest student group focused on neurology (GECEN) it was a pleasure for me to find an article that promoted a campaign to raise awareness of high blood pressure and its relationship with other diseases. One consequence, stroke, is particularly significant to me, and it was an even better surprise to find that the study was performed by several medical colleagues in different hospitals in my country (Mexico). Therefore, to me, it seems remarkable that high blood pressure, which is also known as "the silent killer" is highly prevalent in Mexico where it is established that more than 30% of Mexican adults are affected yet 40% of them do not even known that they have hypertension.[2] So, this is where the recognized association of arterial hypertension as the most important individual risk factor for stroke development comes in and, where I find the campaign and subsequent study carried out by these colleagues, highly noteworthy.[3]

Among the activities that I have carried out over six years as a member of this group, we have focused on stroke prevention in different settings. For example, efforts have been specifically targeted to patients of the university-hospital "Dr. José Eleuterio González" from the *Universidad Autónoma de Nuevo León (UANL),* where I am performing my internship, and which has been my second home for the last three years. At the end of the day, the efforts and awareness campaigns have not only been captured as a good memory, but they can be found in different journals, where the efforts made by my predecessors can be found, as well as the lessons learned; being available to more physicians who are interested in stroke prevention. With the invaluable help of the neurology service professors, we have carried out studies such as the comparison of knowledge achievement after an educational campaign on stroke risk factors, and symptomatology between rural and urban communities, demonstrating that stroke educational campaigns are a cost-effective method for raising stroke awareness and that rural communities can have a greater harnessing of knowledge than urban communities. In addition, the implementations of educational campaigns carried out by medical students are, at the same time, cost-effective and fulfill their purpose of informing the general population.[5] Awareness campaigns are an important resource to educate large portions of the population. It is important to highlight that medical students also need to be educated in stroke awareness.

Last semester in October, the GECEN held an online event to commemorate world stroke awareness day at the UANL medical school, which included talks by professors of the neurology service and guest professors. To explain, among other topics, symptomatology and risk factors; Interestingly, prior to the event, out of a total of 278 students, 19.1% (53 students) had never heard and/or read about stroke. I consider the role of special interest neurology groups to be of undeniable importance for the education of future doctors, as they help current physicians keep their knowledge up to date and maintain higher quality of clinical investigation. Despite the added difficulties of maintaining interest groups during a pandemic, the educational campaigns of my colleagues and predecessors have proved fruitful.

References

1. Yamamoto-Moreno JA, Navarro-Rodríguez SA, Ruiz-Pérez S, Godínez-Reyes JC, Mendoza-Rojo M. Hypertension Awareness, Treatment and Control in Mexico: An Opportunistic Medical Student-led Blood Pressure Screening Campaign – A Cross-Sectional Study. Int J Med Students. 2020 Sep-Dec;8(3):263-9.
2. Campos-Nonato I, Hernández-Barrera L, Rojas-Martínez R, Pedroza A, Medina-García C, Barquera-Cervera S. [Hypertension: prevalence, early diagnosis, control and trends in Mexican adults]. Salud Publica Mex. 2013 Oct;55 Suppl 2:S144-50.
3. Wajngarten M, Silva GS. Hypertension and Stroke: Update on Treatment. Eur Cardiol. 2019 Jul 11;14(2):111-5.
4. Góngora-Rivera F, González-Aquines A, Muruet W, Barrera-Barrera S, Leal-Bailey H, Espinosa-Ortega MA, et al. Difference in Stroke Knowledge between Rural and Urban Communities in a Developing Country after Community-Based Stroke Educational Campaigns: Results from a Cross-Sectional Study. Neuroepidemiology. 2018 Oct;51(3-4):224-9.
5. Gutiérrez-Jiménez E, Góngora-Rivera F, Martínez HR, Escamilla-Garza JM, Villarreal HJ; GECEN Investigators. Knowledge of ischemic stroke risk factors and warning signs after a health education program by medical students. Stroke. 2011 Apr;42(4):897-901.

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Letter to the Editor

Response to Letter to the Editor Regarding "Hypertension Awareness, Treatment, and Control in Mexico: An Opportunistic Medical Student-led Blood Pressure Screening Campaign – A Cross-Sectional Study"

José Adrián Yamamoto-Moreno.[1]

Dear Editor:

This letter is in response to the letter by García-Espinosa, P.[1] which discussed our paper entitled "Hypertension Awareness, Treatment, and Control in Mexico: An Opportunistic Medical Student-led Blood Pressure Screening Campaign – A Cross-Sectional Study".[2] We highly appreciate the interest in our article and the connection that has been made between our findings and stroke prevention. As previously noted in our original paper, hypertension is a growing risk factor for cardiovascular disease, and it has been highlighted as the most important modifiable risk factor for stroke globally.[3]

The primary goal of our study was to describe the current state of hypertension awareness, treatment, control, and its associated factors in the Mexican population. However, there are several other studies that have assessed the association of knowledge, awareness, treatment and control of hypertension with the risk of stroke.[3-7] We found that 5.1% of the hypertensive group had a history of stroke, compared with only 0.3% of the non-hypertensives. Those with a history of a stroke had a mean surplus of 12.11 mmHg in systolic blood pressure (SBP) and 6.64 mmHg in diastolic blood pressure (DBP).[2] These findings are of great interest, because they suggest people with a history of stroke were not properly controlled, although hypertension is considered the most important predictor of stroke recurrence.[8]

Stroke education campaigns are a pivotal step to the prevention of cerebrovascular accidents and their long-lasting sequalae. Such campaigns should include strategies to increase hypertension awareness and control, stressing the primary prevention and early treatment of hypertension. This is supported by data from Murray et al.[4] in which only 34.9% of their study population knew that hypertension was a risk factor for stroke. On the other hand, a study by Barengo et al.[5] showcased that despite antihypertensive drug treatment and adequate control, the risk of stroke remains relatively high.

In our article, most uncontrolled hypertensive patients in Mexico belonged to marginalized states, and the greatest proportion of people unaware of having hypertension were found in the least marginalized regions.[2] This has several implications for public health policy and future research and advocacy. Howard et al.[6] found a similar pattern in which Black participants were more aware of their hypertension but less likely of having their blood pressure controlled than white participants, even though stroke mortality is higher in the "Stroke Belt" (South East) region among Blacks in the United States.

We believe that interventions at all sociodemographic levels should be implemented to increase stroke awareness and prevention. A study by O'Donnell et al.[3] demonstrates that lack of knowledge, detection and treatment of hypertension are the biggest contributors to the risk of stroke in lower-income countries. On the other hand, Joffres et al.[7] reported a strong relationship between hypertension awareness and stroke mortality in the United States, Canada and the United Kingdom. This proves that, although differences in hypertension awareness, treatment and control have been observed between regions at the national and international level,[2] stroke does not discriminate with the same rules.

There is a great area of opportunity to study the associations between hypertension awareness and control with stroke risk in our country. We commend our colleagues for their efforts in the prevention of stroke and hope this response ignites their curiosity to further explore these topics through research. As medical students, it is in your hands to generate the data will enable us to put our countries in the research map.

References

1. García-Espinosa P. Letter to the Editor Regarding "Hypertension Awareness, Treatment, and Control in Mexico: An Opportunistic Medical Student-led Blood Pressure Screening Campaign – A Cross-Sectional Study". Int J Med Students. 2021 Jan-Apr;9(1):96-7.
2. Yamamoto-Moreno JA, Navarro-Rodríguez SA, Ruiz-Pérez S, Godínez-Reyes JC, Mendoza-Rojo M. Hypertension Awareness, Treatment and Control in Mexico: An Opportunistic Medical Student-led Blood Pressure Screening Campaign – A Cross-Sectional Study. Int J Med Students. 2020 Sep-Dec;8(3):263-9.
3. O'Donell M, Hankey GJ, Rangarajan S, Chin SL, Roa-Melacini P, Ferguson J, et al. Variations in knowledge, awareness and treatment of hypertension and stroke risk by country income level. Heart. 2020 Dec 14;107:282–9.
4. Murray M, King C, Sorensen C, Bunick E, King R. Community awareness of stroke, hypertension and modifiable risk factors for cardiovascular disease in Nkonya-Wurupong, Ghana. J Public Health Afr. 2018 Oct 1;9(2):783.

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5. Barengo NC, Hu G, Kastarinen M, Antikainen R, Tuomilehto J. The effects of awareness, treatment and control of hypertension on future stroke incidence in a community-based population study in Finland. J Hypertens. 2009 Jul;27(7):1459–65.

6. Howard G, Prineas R, Moy C, Cushman M, Kellum M, Temple E, et al. Racial and Geographic Differences in Awareness, Treatment, and Control of Hypertension: The REasons for Geographic And Racial Differences in Stroke Study. Stroke. 2006 May;37(5):1171–8.

7. Joffres M, Falaschetti E, Gillespie C, Robitaille C, Loustalot F, Poulter N, et al. Hypertension prevalence, awareness, treatment and control in national surveys from England, the USA and Canada, and correlation with stroke and ischaemic heart disease mortality: a cross-sectional study. BMJ Open. 2013 Aug 30;3(8):e003423.

8. Castilla-Guerra L, Fernandez-Moreno MC. Chronic Management of Hypertension after Stroke: The Role of Ambulatory Blood Pressure Monitoring. J Stroke. 2016 Jan;18(1):31–7.

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