

## EDITORIAL

- Medical Student Research Journals: The International Journal of Medical Students (IJMS) Legacy
- War on Ukraine: Impact on Ukrainian Medical Students

## ORIGINAL ARTICLE

- Reliability and Discriminant Validity of a Checklist for Surgical Scrubbing, Gowning and Gloving
- Reliability Generalization of the Medical Student Stressor Questionnaire
- Teachers' View on Online Classes during the COVID-19 Lockdown – A Cross-Sectional Study
- Predictors of Early (0-7 Days) and Late (8-30 Days) Readmission in a Cohort of Acute Coronary Syndrome Patients

- Clinical Elective Choices and Motivations for Future Career Specialty Selection of Medical School Trainees and Junior Doctors of the University of the West Indies, Jamaica
- Medical Student Teleconferencing Experiences and Financial Status: A Cross-Sectional Survey
- Assessing Medical Students' Self-Perceived Preparedness to Care for Gender Diverse Patients: A Survey Study

## SHORT COMMUNICATION

- Rationalizing the Pediatric Emergency Department Workload: An Epidemiological Profile of Presentations Before and During the COVID-19 Pandemic

## REVIEW

- Childhood Effects of Prenatal and Postnatal Exposure to Mercurial Skin Lightening Agents. Literature Review

## CASE REPORT

- Dyke-Davidoff-Masson Syndrome: A Case Report

## EXPERIENCE

- Eye-Opening Medical Missions
- Medical Interns as Volunteers in the COVID-19 Vaccination Drives in the Philippines
- Experience in a Palliative Care Unit in a Mexican Tertiary Level Hospital
- A Medical Student's Perspective on the Growing Importance of Telemedicine / Telerehabilitation
- The Student Dermatology Clinic for the Underserved: A Service-Learning Model to Promote Skin Health Equity
- ASPIRE – A Journey from Intuition to Innovation



IJMS

INTERNATIONAL JOURNAL *of*  
MEDICAL STUDENTS

***International Journal of Medical Students***

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

# International Journal of Medical Students

## Year 2022 - Volume 10 - Issue 1

### EDITORIAL STAFF

#### Editor in Chief

Francisco Javier Bonilla-Escobar, MD, MSc, PhD(c)  
University of Pittsburgh, USA. University of Valle, Colombia

#### Scientific Editor

Mihnea-Alexandru Găman, MD, PhD student

"Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

#### Deputy Editor

Ciara Egan, BSc

Humanitas University, Milan, Italy

### ASSOCIATE EDITORS

Adnan Mujanovic, MD

University of Bern, Bern, Switzerland

André Yvan Zolo Ossou, MD, MSc

University of Cape Town, South Africa

Andrew Thomas, MBBS student

SreeGokulam Medical College and Research Foundation, India

Francisco Jesus Barrera Flores, MD

Harvard University, Boston, Massachusetts, USA

Kiera Liblik, BSc (H), Medical Student

Queen's University, Kingston, Canada

Madeleine J. Cox, MD

University of New South Wales, Sydney, Australia

Mohamed Fahmy Doheim, MBBCh(c)

Alexandria University, Alexandria, Egypt

Mohammad A. Khazeei Tabari, Medical student

Mazandaran University of Medical Sciences, Iran

Najdat Bazarbashi, MD

University of Maryland School of Medicine, Baltimore, MD, USA

Nathaniel Edward Hayward, MB BCH

BAO, MSc.

University of Utah, Salt Lake City, Utah, USA

Paul Marcel Morgan, BSc, MD, PhD(c)

University of Belize, Karl Hushner Memorial Hospital, Belize

Sohaib Haseeb, BSc, MD(c)

James Cook University, Queensland, Australia

Sushil Dahal, MBBS

Kathmandu University Hospital, Nepal

Vincent Kipkorir, BSc(H)

University of Nairobi, Kenya

### STUDENT EDITORS

Abdul Basith KM

Jawaharlal Institute of Postgraduate Medical Education and Research, India

Adam Dinoff

New York Medical College, NY, USA

Adam L. Urback

Ben-Gurion University, Be'er Sheva, Israel

Adnan Mujanovic

University of Tuzla Medical Faculty, Bosnia and Herzegovina

Andrew Thomas

Sree Gokulam Medical College and Research Foundation, India

Bahadar Singh Srichawla

Touro College of Osteopathic Medicine, NY, USA

Benjamin Liu

Medical College of Wisconsin, Milwaukee, WIS, USA

Brandon Belbeck

University of Western Ontario, Canada

Diego Carrion Alvarez

Universidad de Monterrey, Mexico

Duha Shellah

An-Najah National University, Palestine

Eugenia M. Ramos-Dávila, MD

Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico

Johnmark Boachie

University of Cape Coast, Ghana

Joseph Tonge

Academic Unit of Medical Education, The University of Sheffield, UK

Leah Komer

University College Cork, Cork, Ireland

Lourdes Adriana Medina Gaona

Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico

L V Simhachalam Kutikuppala

Konaseema Institute of Medical Sciences and Research Foundation, India

Madeleine J. Cox

University of New South Wales, Sydney, Australia

Manas Pustake

Grant Government Medical College, Mumbai, India

Michael Tavolieri

University College Cork, School of Medicine, Ireland

Mohammad Amin Khazeei Tabari

Mazandaran University of Medical Sciences, Iran

Mohamed Fahmy Doheim

Alexandria University, Alexandria, Egypt

Muhammad Romail Manan

University of Health Sciences, Lahore, Pakistan

Nguyen Tran Minh Duc

University of Medicine and Pharmacy, HCM, Vietnam

Nikoleta Tellios

University College Cork, Cork, Ireland

Purva Shah

Medical College, Baroda, India

Rahul Regi Abraham

LSUHSC Shreveport, LA, USA

Shuo-Yan Gau

School of Medicine, Chung Shan Medical University, Taiwan

Vinson Wai-Shun Chan

University of Leeds, UK

Yusuff Adebayo Adebisi

University of Ibadan, Ibadan, Nigeria

### EDITORIAL BOARD

Abdel Kareem Azab, PhD.

Washington University in St Louis, St Louis, MO, USA

Abdelrahman I. Abushouk, MD.

Harvard Medical School, Boston, MA, USA.

Abhishekh Hulegar Ashok, MD.

National Institute of Mental Health and Neurosciences, UK.

Adrian Baranchuk, MD, FACC, FRCP.

Queen's University, Kingston, ON, Canada.

Amelia Maria Găman, MD, PhD.

University of Medicine and Pharmacy of Craiova, Craiova, Romania.

Americo Peña, MD.

IRCCS San Raffaele Hospital, Milan, Italy.

Atanas G. Atanasov, PhD.

Polish Academy of Sciences. University of Vienna, Austria.

Bogdan Socea, MD, PhD.

"Carol Davila" University of Medicine and Pharmacy, Romania.

Cain C. T. Clark, BSc, MSc, PhD.

University Hospitals Coventry & Warwickshire, UK

Eshetu Girma, MPH, PhD.

Addis Ababa University, Ethiopia

Herney Andrés García-Perdomo, MD, MSc, EdD, PhD.

University of Valle, Cali, Colombia

Jorge Enrique Gomez-Marin, MD, MSc,

PhD.

University of Quindío, Armenia, Colombia

Juan Carlos Puyana, MD, FRCS, FACS,

FACCP.

University of Pittsburgh, Pittsburgh, PA, USA

Juliana Bonilla-Velez, MD.

University of Washington, Seattle, WA, USA

Mark Zafereo, MD, FACS.

MD Anderson Cancer Center, TX, USA.

Matouš Hrdinka, MSc, PhD.

University Hospital Ostrava, Ostrava, Czech Republic.

Mohamed M. Gad, MD.

Department of Internal Medicine, Cleveland Clinic, OH, USA

Paul MacDaragh Ryan, MD, BCH, PhD.

Hospital for Sick Children, Toronto, Canada.

Rahul Kashyap, MD.

Mayo Clinic, Rochester, MN, USA.

Spyridoula Maraka, MD.

University of Arkansas for Medical Sciences, Little Rock, USA.

Srinivas Vinod Saladi, MD.

Massachusetts Eye and Ear Infirmary, Harvard Medical School, MA, USA.

William C. Cho, PhD.

Queen Elizabeth Hospital, Kowloon, Hong Kong, China.

### ANCILLARY POSITIONS

#### Layout Editors

Anna-Maria Dimitrova Chantaliyska

Medical University of Pleven, Bulgaria

Cesare Mercalli

Humanitas University, Milan, Italy

Fatma Monib

Assiut University, Egypt

Judie Y. Joo

The University of Western Australia, Australia

Lina Hemmeda

University of Khartoum, Khartoum, Sudan

Lucianne Odiero

The University of Nairobi, Nairobi

Sajjad Ali

Ziauddin Medical University, Pakistan

Sushil Dahal

Kathmandu University Hospital, Nepal

#### Production Manager

Annora A. Kumar

The University of Western Australia, Australia

#### Editorial Assistant Managers

Ana Maria Morales

University of Valle, Colombia

Natalia Galindo

Universidad Santiago de Cali, Colombia

### SUPPORT COMMITTEE OF PUBLIC RELATIONS AND COMMUNICATIONS

#### Director

Preeyati Chopra

Government Medical College, Patiala, Punjab, India

#### Graphic Designer

Mahfuza Anan

Bangladesh Medical College, Bangladesh

#### Social Media Managers

LinkedIn: Noor ul Huda Maria

Instagram: Purva C. Shah & Preeyati Chopra

Twitter: Sajjad Ali

### PARTNERS

APSA NERC. American Physician Scientist Association, USA

COIMAMA. International Academic Medical Congress of

Maranhão, Brazil

COMAPI. Academic Medical Congress of Piauí, Brazil

CoMAU. Congress of Medical Students of Unicamp, Brazil

COMUMC. Congresso Médico Universitário De Mogi Das

Cruzes, Brazil

Connect MSC. Connect Medical Students' Congress,

Brazil

CSurgeries. USA

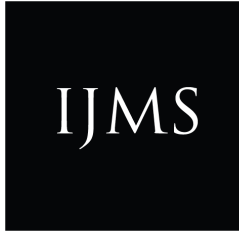
IMSCB. International Medical Students' Congress of Bucharest,

Romania

YiRS. Yorkshire Imaging and Interventional Radiology Symposium

International

SaMED. International Medical Students' Congress Sarajevo



# INTERNATIONAL JOURNAL *of* MEDICAL STUDENTS

The *International Journal of Medical Students* (IJMS) is an open-access, peer-reviewed scientific journal (ISSN [2076-6327](#)) that publishes original research in all fields of medicine. The Journal was created in 2009 to share the scientific production and experiences of medical students (*i.e.*, MBBS students, MD students, DO students, MD/MSc students, MD/PhD students, etc.) and recently graduated physicians from all over the world. Our objective is to be the primary diffusion platform for early-career scientists, using standards that follow the process of scientific publication.

The *IJMS* receives submissions where there is at least one author enrolled as a medical student in any medical school in the world or a recently graduated physician worldwide. For research articles, early-career scientists must be accompanied by a senior researcher that must be also responsible for the research, guaranteeing the quality of the work. We publish Original Articles, Short Communications, Reviews, Case Reports, Interviews, Experiences, and Letters, which follow an [innovative and unique two-step, double-masked peer-review process](#), in brief:

*The first step of revisions is carried out by two Student Editors (medical students with publications indexed in the US National Library of Medicine (NLM) with the supervision of an Associate Editor. The aim of this step is to improve the quality of articles and identify those that can proceed to external peer-reviews. The second step of revisions is carried out by external peer-reviewers who are researchers with publications indexed in the NLM related to the topic of the submission.*

The time between submission and final publication in most cases has been two to four months depending on the diligence of Peer-Reviewers and Authors.

The *International Journal of Medical Students* is published online quarterly (March, June, October, December) by the [University of Pittsburgh Library System](#), a member of the [Open Access Scholarly Publishers Association](#), as part of its Pitt Open Library Publishing imprint.

The journal main office is located in the United States of America (USA). Any publication, dissemination or distribution of the information included in the Journal is permitted if the source is cited (*Int J Med Stud*).

The *International Journal of Medical Students* is indexed or abstracted in: Bielefeld Academic Search Engine (BASE), Dialnet Foundation (Dialnet), Directory of Open Access Journals (DOAJ), Directory of Research Journals Indexing, Elektronische Zeitschriftenbibliothek (EZB), e-Revistas, Geneva Foundation for Medical Education and Research, Google Scholar, Health InterNetwork (HINARI), Journal Seek Database, List of Publications that follow the International Committee of Medical Journal Editors (ICMJE), Mexican Index of Latin American Biomedical Journals (IMBIOMED), NewJour, Open Academic Journals Index (OAJI), Online Computer Library Center (OCLC) WorldCat, Pubshub, Research Bible, Rubriq, SHERPA/RoMEO, Scientific Indexing Services (SIS), The e-Journal Gateway (J Gate), The Open Access Digital Library, Ulrich's International Periodical Directory/Summon by Serial Solutions.

The *IJMS* acceptance rate is 18% of the almost 350 annual submissions. Published articles in 2021 came from 32 different countries. The average days to a first decision is 14 days, 143 for acceptance, and 31 to decline a submission. The time between submission and final publication in most cases has been three to four months depending on the diligence of Peer-Reviewers and Authors.

The journal's website got over 75 thousand visits only in 2021. The *IJMS*'s reach includes a growing social media presence (more than 15,000 followers on [Twitter](#), [Facebook](#), [Instagram](#), and [LinkedIn](#)). Only in the last 2 years, the Journal has been visited from nearly every place in the world (+190 countries). You can find more of the *IJMS* [statistics here](#).

The Journal and the Editorial Board are not responsible for the opinions expressed by the Authors of all materials published, nor do these represent the Official Policy or medical opinion of the Journal or the institutions with which they are affiliated unless otherwise stated.

### ***Open Access Policy***

This journal provides immediate open access to its content. Our publisher, the University Library System at the University of Pittsburgh, abides by the Budapest Open Access Initiative definition of Open Access to open access to peer-reviewed research literature as "(...) free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited."

Furthermore, we encourage authors to post their pre-publication manuscript in institutional repositories or on their websites prior to and during the submission process, and to post the Publisher's final formatted PDF version after publication. These practices benefit authors with productive exchanges as well as earlier and greater citation of published work.

*There are no article processing charges, submissions fees, or any other costs required of authors to submit, review or publish articles in the IJMS.*

### ***Peer Review Process***

All papers submitted to the International Journal of Medical Students will undergo a two steps peer-reviewers process. The first step of revisions is carried by two anonymous Student Editors who will work together with one Associate Editor. In the second step, the manuscript will be reviewed by two anonymous reviewers (Editorial Board members, Associate Editors and/or invited reviewers with expertise in the subject matter). Authors will remain anonymous to all the referees.

The *IJMS* review process guarantees and supports the quality and validity of the work published at the *IJMS*. Reviewers are given three weeks to complete their tasks.

Reviewers and editors are obliged to retain the contents as privileged and confidential until publication. The Editor in Chief and the Editorial Board will have final authority over an article's suitability for publication.

The *IJMS* also strive towards the training of a new generation of Editors and Peer-reviewers promoting different training strategies among our Editorial Team that includes the [Web of Science Academy courses](#) and the [Committee on Publication Ethics \(COPE\)](#) courses available to its members (*IJMS* is a member of COPE).

### *Archiving*

This journal utilizes the LOCKSS system to create a distributed archiving system among participating libraries and permits those libraries to create permanent archives of the journal for purposes of preservation and restoration.

### *License*



New articles in this journal are licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

### **Editorial Office:**

1400 Locust Street  
Suite 3103  
Pittsburgh, PA 15219.  
United States of America (USA)  
Tel.: 413-232-7884  
Fax: 412-232-8966

All full-text articles are available at: [www.ijms.info](http://www.ijms.info)

e-ISSN 2076-6327 (Online)

---

The *International Journal of Medical Students* is licensed under a *Creative Commons Attribution 4.0 International License*.  
Issued in Pittsburgh, PA, USA.

# International Journal of Medical Students

Year 2022 • Months Jan-Mar • Volume 10 • Issue 1

Int J Med Stud. 2022 Jan-Mar; 10(1)

## Table of Contents

Page

### Editorial

Medical Student Research Journals: The International Journal of Medical Students (IJMS) 9

Legacy

Kiera Liblik, Patricio Garcia-Espinosa, Ahmed Nahian, Surobhi Chatterjee, Mihnea-Alexandru Găman, Ciara Egan, Juan C. Puyana, Francisco J. Bonilla-Escobar.

War on Ukraine: Impact on Ukrainian Medical Students 15

Bahadar Singh Srichawla, Mohammad Amin Khazeei Tabari, Mihnea-Alexandru Găman, Alejandro Munoz-Valencia, Francisco J. Bonilla-Escobar.

### Original Article

Reliability and Discriminant Validity of a Checklist for Surgical Scrubbing, Gowning and Gloving 18

Stephen P. Canton, Christine E. Foley, Isabel Fulcher, Laura K. Newcomb, Noah Rindos, Nicole M. Donnellan.

Reliability Generalization of the Medical Student Stressor Questionnaire 25

Mason A. Montano, Samuel A. Montano, Jennifer L. Harrison, Trisha M. Kivisalu.

Teachers' View on Online Classes during the COVID-19 Lockdown – A Cross-Sectional Study 32

Andrew Thomas, Mohan T. Shenoy, Kotacherry T. Shenoy, Sruthi Suresh Kumar, Aboobakker Sidheeque, C. Khovidh, Jayakumar Parameshwaran Pillai, Pramod Murukan Pillai, Shana Sherin CH, Anna Mathew, Twinkle Zakkir, Sreelakshmi Dileep, Victory Mekha, Sony Raju, Mohammed Junaid K, Sivendu P.

Predictors of Early (0-7 Days) and Late (8-30 Days) Readmission in a Cohort of Acute Coronary Syndrome Patients 38

George Cholack, Joshua Garfein, Rachel Krallman, Delaney Feldeisen, Daniel Montgomery, Eva Kline-Rogers, Geoffrey D. Barnes, Kim Eagle, Melvyn Rubenfire, Sherry Bumpus.

Clinical Elective Choices and Motivations for Future Career Specialty Selection of Medical School Trainees and Junior Doctors of the University of the West Indies, Jamaica 49

Jean Williams Johnson, Leohrandra Graham, Eric Williams, Colleen Campbell, Nidhi Thomas, Maxine Gossell-Williams.

Medical Student Teleconferencing Experiences and Financial Status: A Cross-Sectional Survey 56

Ivy A. Huang, Yasmeen Dhindsa, Alina J. Chen, James Wu, Justin P. Wagner, Areti Tillou Formosa Chen.

Assessing Medical Students' Self-Perceived Preparedness to Care for Gender Diverse Patients: A Survey Study 63

Kyra L. Bonasia, Allie Morgan, Christina Grace Solomon, Ella A. Damiano.

# International Journal of Medical Students

Year 2022 • Months Jan-Mar • Volume 10 • Issue 1

Int J Med Stud. 2022 Jan-Mar; 10(1)

## Short Communication

- Rationalizing the Pediatric Emergency Department Workload: An Epidemiological Profile of Presentations Before and During the COVID-19 Pandemic 69  
Hannah Farley, Helen Bennett, Sahana Rao.

## Review

- Childhood Effects of Prenatal and Postnatal Exposure to Mercurial Skin Lightening Agents. Literature Review 74  
Rebecca Murerwa, Fidel Gwala, Thomas Amuti, Mary Muange.

## Case Report

- Dyke-Davidoff-Masson Syndrome: A Case Report 82  
Gaurav M. Urs, Hitesh R. Doddabele.

## Experience

- Eye-Opening Medical Missions 86  
Ethan Waisberg.
- Medical Interns as Volunteers in the COVID-19 Vaccination Drives in the Philippines 89  
Ian Christopher N. Rocha, Kimberly G. Ramos, Alyssa A. Solaiman-Balt, Trisha Denise D. Cedeño.
- Experience in a Palliative Care Unit in a Mexican Tertiary Level Hospital. 92  
Patricio García-Espinosa.
- A Medical Student's Perspective on the Growing Importance of Telemedicine / Telerehabilitation 95  
Sung-Hoon Park, Nuray Yozbatiran.
- The Student Dermatology Clinic for the Underserved: A Service-Learning Model to Promote Skin Health Equity 98  
Bansri M. Patel, Victoria Humphrey, Alaina J. James.
- ASPIRE - A Journey from Intuition to Innovation 101  
Alhad Mulkalwar.



# Medical Student Research Journals: The International Journal of Medical Students (IJMS) Legacy

Kiera Liblik,<sup>1</sup> Patricio Garcia-Espinosa,<sup>2</sup> Ahmed Nahian,<sup>3</sup> Surobhi Chatterjee,<sup>4</sup> Mihnea-Alexandru Găman,<sup>5</sup> Ciara Egan,<sup>6</sup> Juan C. Puyana,<sup>7</sup> Francisco J. Bonilla-Escobar.<sup>8</sup>

As the longest-standing, non-interrupted, International Journal for Medical Students with a high impact, visibility, and an international inclusive editorial board, the objective of the International Journal of Medical Students (IJMS) is to be the primary diffusion platform for early-career scientists in medicine, using evidence-based standards in the process of scientific publication.<sup>1</sup> It is crucial that medical students are valued and credited for their work which, in turn, can lead to tremendous impact on the quality of research output generated and education of the next generation of the global medical-scientific community. This objective has been met since 2013 with the first issue of the IJMS, starting from a unique idea reached during a discussion at an international congress of medical students in 2009.<sup>1,2</sup>

Since, the history of the IJMS has been anything but meager. It has achieved a significant milestone sought by emerging medical journals worldwide; the indexing of a publication in PubMed Central (PMC).<sup>2</sup> A group of researchers, including medical students, were funded by the National Institute of Health (NIH) of the United States and chose IJMS for their high-quality article.<sup>3</sup> This demonstrates that, indeed, a journal focusing on medical students and created and edited by themselves is not at odds with quality, despite traditional misconceptions.<sup>4</sup>

Times are changing. The process of scientific production has traditionally 'punished' medical students, in the words of Corral-Reyes, I.<sup>5</sup> The process that the medical student must carry out is even greater than those that some renowned authors must take, even if they are practically the same. The publication process is complicated not because of the lack of quality but because of the stigma around their scientific production. Although, as the same author emphasizes, there is a lack of valuation of their own work

and lack of expertise when it comes to perceiving how, when, and where to publish; the absence of a publication culture.<sup>5</sup>

Therefore, it is necessary to encourage medical student journals to value student growth and commitment to research, giving rise to space for visualization and training. This culture began in Latin America in 1961 with the Cuban magazine "16 de Abril" (April 16).<sup>5</sup> This tradition of more than 60 years is precisely what has opened and seeded the path for journals like the IJMS to flourish in a difficult and sometimes arid environment for medical student research.

What started as an international project from Latin-America has become a Journal whose team represents 34 different nationalities across all the continents, made up of researchers, mentors, and experts in various fields of medicine. The IJMS focuses on the growth and expansion of the scientific medical-student community. Thus, creating a space not only for sharing science and innovation, but a voice behind the experiences, failures, and hardships inclusive and representative of the diverse, dynamic, medical student global community. Moreover, it is important to highlight that all Student and Associate Editors of the IJMS, as well as its Executive Committee, are graduates of the peer-review training courses offered by Web of Science Academy.

The scientific literature includes a wide range of medical student journals, pursuing different objectives, goals, and strategies to achieve their respective aims. An overview of these journals is shown in **Table 1** (excluding those that do not publish original research).

<sup>1</sup> BSc. Faculty of Medicine, Queen's University, Kingston, ON, Canada. Associate Editor, IJMS.

<sup>2</sup> Social Service Medical Doctor. School of Medicine, Universidad Autónoma de Nuevo León, Monterrey, México and Mexican Institute of Social Security. Palliative Care Unit. High Specialty Medical Unit #25, Monterrey, México. Student Editor, IJMS.

<sup>3</sup> BS/DO Medical Student. California Baptist University-Lake Erie College of Osteopathic Medicine, Riverside, CA. United States. Student Editor, IJMS.

<sup>4</sup> MBBS, Intern Doctor. Department of Medicine, King George's Medical University, Lucknow, Uttar Pradesh, India. Student Editor, IJMS.

<sup>5</sup> MD, PhD student. Faculty of Medicine, "Carol Davila" University of Medicine and Pharmacy, 050474 Bucharest, Romania & Department of Hematology, Center of Hematology and Bone Marrow Transplantation, Fundeni Clinical Institute, 022328 Bucharest, Romania. Scientific Editor, IJMS.

<sup>6</sup> Medical Student. Humanitas University, Humanitas Research Hospital, Milan, Italy. Deputy Editor, IJMS.

<sup>7</sup> MD, FRCS, FACS, FACCP. School of Medicine, Department of Surgery, Professor of Surgery, Critical Care Medicine, and Clinical Translational Science, Director for Global Health-Surgery, University of Pittsburgh, Pittsburgh, PA, United States. Editorial Board Member, IJMS.

<sup>8</sup> MD, MSc, PhD(c). Researcher, Department of Ophthalmology; Institute for Clinical Research Education (ICRE), University of Pittsburgh, Pittsburgh, PA, United States. CEO, Fundación Somos Ciencia al Servicio de la Comunidad, Fundación SCISCO/Science to Serve the Community Foundation, SCISCO Foundation, Cali, Colombia. Grupo de investigación en Visión y Salud Ocular, VISOC, Universidad del Valle, Cali, Colombia. Editor in Chief, IJMS.

Correspondence: Francisco J. Bonilla-Escobar. <https://orcid.org/0000-0002-0224-3482>. Address: 1400 Locust St. Suite 5000, Pittsburgh PA, 15219, USA. Email: [editor.in.chief@ijms.info](mailto:editor.in.chief@ijms.info)

**Table 1.** Medical Student Research Journals Around the World.

| JOURNAL  | COUNTRY     | FOUNDATION | UNINTERRUPTED ACTIVE YEARS | ORGANIZATION  | READERS PER YEAR   | H-INDEX** | H5-INDEX** |
|--|-------------|------------|----------------------------|---|--|-----------|------------|
| <b>16 de Abril</b> <sup>22</sup>               | Cuba        | 1961       | 1962-2022                  | Universidad de Ciencias Médicas de la Habana                        | 15802 users, 60000 readers   | 3         | 4          |
| <b>AMSJ</b> <sup>7</sup>                       | Australia   | 2009       | 2010-2021                  | UNSW  | 17,000; more than 5000 email subscribers, 2000 copies for all Australian med schools | N/D       | N/D        |
| <b>AMSRJ</b> <sup>15</sup>                     | USA         | 2013       | 2014-2020                  | LSU Shreveport  | N/D  | N/D       | N/D        |
| <b>ANACEM</b> <sup>22</sup>                    | Chile       | 2007       | 2007-2021                  | ANACEM  | N/D  | 4         | 6          |
| <b>Científica Ciencia Médica</b> <sup>22</sup> | Bolivia     | 1994       | 1997-2021                  | Universidad Mayor San Simón   | 23505 users, 61519 readers (2021)  | 5         | 6          |
| <b>CIMEL</b> <sup>22</sup>                     | Peru        | 1995       | 1995-2022                  | FELSOCEM  | N/D  | 3         | 6          |
| <b>CRMJ</b> <sup>16</sup>                      | USA         | 2018       | 2018-2022                  | Cooper Medical School of Rowan University                           | 4000 per year  | N/D       | N/D        |
| <b>DMJ</b> <sup>20</sup>                       | Canada      | 1936       | 2003-2022                  | Dalhousie University  | 3440 Total   | N/D       | N/D        |
| <b>FMSRJ</b> <sup>9*</sup>                     | USA         | 2015       | 2016-2020                  | Herbert Wertheim College of Medicine.                               | N/D  | N/D       | N/D        |
| <b>IJMS</b> <sup>12</sup>                      | USA         | 2012       | 2013-2022                  | University of Pittsburgh  | 71,000 users (2021), 263,383 pageviews   | 9         | 16         |
| <b>Médica MD</b> <sup>22</sup>                 | Mexico      | 2009       | 2009-2022                  | Universidad de Guadalajara  | N/D  | 5         | 7          |
| <b>Médicas UIS</b> <sup>22</sup>               | Colombia    | 1987       | 1987-2022                  | Universidad Industrial de Santander                                 | 54374 users, 72,000 readers (2021)   | 5         | 10         |
| <b>NZMSJ</b> <sup>18</sup>                     | New Zealand | 2003       | 2004-2021                  | University of Otago/ University of Auckland                         | N/D  | N/D       | N/D        |
| <b>SJHR-AFRICA</b> <sup>23</sup>               | Uganda      | 2020       | 2020-2022                  | HENU, Health Nest Uganda, Student's Health Research, Africa Limited | N/D  | 4         | 6          |
| <b>UBCMJ</b> <sup>21</sup>                     | Canada      | 1962       | 2009-2022                  | University of British Columbia                                      | N/D  | N/D       | N/D        |
| <b>UTMJ</b> <sup>10</sup>                      | Canada      | 1923       | 1923-2022                  | University of Toronto   | N/D  | 5         | 6          |

**Legend:** Considering only Journals with Original Articles and Medical Students as authors.

AMSJ: Australian Medical Student Journal, AMSRJ: American Medical Student Research Journal, ANACEM: Asociación Nacional Científica de Estudiantes de Medicina, CIMEL: Ciencia e Investigación Médica Estudiantil Latinoamericana, CRMJ: Cooper Rowan Medical Journal, DMJ: Dalhousie Medical Journal, FMSRJ: Florida Medical Student Research Journal, FMSRP: Florida Medical Student Research Publications, IJMS: International Journal of Medical Students, NZMSJ: New Zealand Medical Student Journal, SJHR-Africa: Students' Journal of Health Research Africa, UBCMJ: University of British Columbia Medical Journal, UTMJ: University of Toronto Medical Journal.

\*The FMSRJ was published from 2015 to 2020 and then changed to Cureus journal/publications under a channel named FMSRP.

\*\*H-INDEX and H5-INDEX obtained from Google Scholar Statistics: available at: [https://scholar.google.com/citations?view\\_op=metrics\\_intro&hl=en](https://scholar.google.com/citations?view_op=metrics_intro&hl=en). For journals that were not available in Google Scholar, the statistics provided by the journal's own web page were consulted, or searched through the international bibliography.

Those data not found are marked with the legend N/D: No Data.

**Table 1.** Medical Student Research Journals Around the World. (*continued*)

| JOURNAL  | MOST READ ARTICLE<br>(reads, Last name) | MOST CITED<br>(citations, Last name) | INDEXING   | LANGUAGE            | PERIODICITY | PUBLICATION TYPE      |
|--|---|--------------------------------------|--|---------------------|-------------|-----------------------|
| <b>16 de Abril</b> <sup>22</sup>                   | 1923, Arman-Pereda, D. <sup>23</sup>    | 11, Guilarte. <sup>24</sup>          | Google Scholar, IMBIOMED, LATINDEX, BIBLAT, MEDIGRAPHIC  | English and Spanish | Triannual   | Electronic            |
| <b>AMSJ</b> <sup>7</sup>                           | N/D                                     | 19, Nguyen M. <sup>8</sup>           | Google Scholar   | English             | Biannual    | Electronic and Print. |
| <b>AMSRJ</b> <sup>15</sup>                         | N/D                                     | N/D                                  | N/A  | English             | Annual      | Electronic and Print  |
| <b>ANACEM</b> <sup>22</sup>                        | N/D                                     | N/D                                  | Latindex, Imbiomed, Index Copernicus, EBSCO, LILACS, Google Scholar, Academic Journals Database                        | English and Spanish | Biannual    | Electronic and Print  |
| <b>Científica<br/>Ciencia Médica</b> <sup>22</sup> | N/D                                     | N/D                                  | SciElo Bolivia, Redalyc, DOAJ, Latindex, Redib, EBSCO, ROAD, Lilacs, Dialnet, MIAR, Crossref, Imbiomed, Google Scholar | Spanish             | Biannual    | Electronic and Print  |
| <b>CIMEL</b> <sup>22</sup>                         | N/D                                     | N/D                                  | DOAJ, REDIB, Imbiomed, OAJ, DRJI, Google Scholar, Latindex, Lilacs, Europub, Google Scholar                            | English and Spanish | Biannual    | Electronic and Print  |
| <b>CRMJ</b> <sup>16</sup>                          | 1228, Ellis, S. <sup>17</sup>           | N/D                                  | DOAJ, Google Scholar   | English             | Annual      | Electronic and Print  |
| <b>DMJ</b> <sup>20</sup>                           | N/D                                     | N/D                                  | N/D  | English             | Biannual    | Electronic            |
| <b>FMSRJ</b> <sup>9*</sup>                         | N/D                                     | N/D                                  | N/D  | English             | Annual      | Electronic.           |
| <b>IJMS</b> <sup>12</sup>                          | 6810, Rondilla, et al. <sup>13</sup>    | 54, Bawazeer NA. <sup>14</sup>       | BASE; DOAJ; EZB; Google Scholar, HINARI, IMBIOMED, OCLC, J GATE  | English             | Quarterly   | Electronic            |
| <b>Médica MD</b> <sup>22</sup>                     | N/D                                     | N/D                                  | Imbiomed, EBSCO, AMERBAC, LATINDEX, REDIB, MEDIGRAPHIC, ACADEMIC ONE FILE  | English and Spanish | Triannual   | Electronic and Print  |
| <b>Médicas UIS</b> <sup>22</sup>                   | N/D                                     | N/D                                  | SciElo Colombia, LILACS, REDIB, Dialnet, EBSCO, Hinari, Periódica, Imbiomed, Pubindex                                  | English and Spanish | Quarterly   | Electronic and Print  |
| <b>NZMSJ</b> <sup>18</sup>                         | N/D                                     | 18. Al-Busaidi I. <sup>19</sup>      | Google Scholar   | English             | Biannual    | Electronic and Print  |
| <b>SJHR-AFRICA</b> <sup>23</sup>                   | N/D                                     | N/D                                  | DOAJ, Google Scholar, Science Gate, OUCI   | English             | Quarterly   | Electronic            |
| <b>UBCMJ</b> <sup>21</sup>                         | N/D                                     | N/D                                  | N/D  | English             | Biannual    | Electronic            |
| <b>UTMJ</b> <sup>10</sup>                          | N/D                                     | 32, Cape J. <sup>11</sup>            | Scopus, Google Scholar   | English             | Triannual   | Electronic and Print  |

**Legend:** Those data not found are marked with the legend N/D: No Data.

Although the success of these journals has been noteworthy and has been framed by decades of continuous publication, others, sadly, have not been able to prevail to the challenge of publishing scientific articles by medical students. Particularly, these journals have the tasks of reviewing, editing, and publishing; which sometimes must be accompanied by correction, education, and teaching of the next generation of medical scientists. This is not a small task and has led to the demise of these journals. Among them we can find the Medical Student Journal of Australia, Trinity Student Medical Journal, Asian Student Medical Journal Genesis, MJM, International Journal of Students' Research, Dares Salam Medical Students' Journal, Scottish Universities Medical Journal, Acta Científica Estudiantil, Esculapio, SCEMUSS, SCientífica, among others.<sup>27,28</sup>

Though the IJMS is published in English for ease of integration into mainstream literature, the IJMS has a tremendous advantage in that our diversity of authors encompasses 39 different countries in the past year alone.<sup>26</sup> Accordingly, we are newly

integrating a summary for non-scientific audiences of each article in the language where the research was carry out. This serves to streamline the translation of scientific knowledge, allowing easy access for knowledge users in the context in which the research was conducted.

The present issue, composed of 16 articles, showcases work by authors from a wide variety of countries, including India, Mexico, the Philippines, the United Kingdom, Kenya, Ireland, and different parts of the United States. Authors include students, early career researchers, and mentors with impressive academic qualifications. To believe that because a journal is formative, orienting, and attractive to medical students, that it is less impactful is to proverbially judge a book by its cover. Some of the greatest revolutions in medicine and beyond were led by trainees and the IJMS aims to be one such in providing academic representation to students.

In this issue, we are publishing 10 original research papers: 7 original articles, 1 short communication, 1 review, and 1 case

report. In addition, we are publishing 6 experiences from medical students worldwide that could be of help when facing the realities of medical education. The contents of this work is summarized, as follows.

In addition, we are publishing six experiences from medical students worldwide to aid in understanding the realities of medical education during a time of global unrest. First, an editorial about the war on Ukraine and how this is impacting medical education in the country. This is the first time that the IJMS has published an editorial on political conflict. Though, as discussed in the previous IJMS volume, medical students are global citizens and affected by global situations, such as wars and climate change.<sup>29-31</sup> It is critical that these issues be discussed and addressed. In our editorial we make a call for violent conflict to be halted and to use discussion and collaboration in the context of political discourse.<sup>32</sup>

Due to the high degree of reported distress experienced by medical trainees, it is critical that reliable metrics are developed to elucidate key stressors in this population. Thus, medical student Montano et al. sought to determine the reliability of the Medical Student Stressor Questionnaire. They determined that the reliability of the questionnaire is excellent and that stressors varied by sex.<sup>33</sup> In terms of measuring perceived competency, recent medical school graduate Canton et al. assessed the efficacy of a surgical scrubbing, gowning, and gloving checklist for trainees. Their checklist had high inter-rater reliability and internal consistency.<sup>34</sup> Another interesting study on training, a cross-sectional study conducted with the fifth-year medical student Nidhi Thomas, showed that of students who chose an elective rotation, the minority pursued a specialty in that discipline.<sup>35</sup> Notably, Huang et al. found that one of the barriers to matching to specialties is socioeconomic inequality impacting interviews due to connection and audio problems.<sup>36</sup> It is similarly important that the perspectives of medical educators be integrated in the evaluation of education. Educators have had to adapt to online teaching during the COVID-19 pandemic, with a lack of adequate warning or training. Final-year medical student Andrew Thomas collaborated with a team of investigators to determine educators' attitudes to online learning. They reported a need for better infrastructure to support interactive learning in an online format. Interestingly, almost half of the participants supported continued online learning.<sup>37</sup>

Beyond online learning, telecommunication is one of the most utilized medical tools during the COVID-19 pandemic. Park et al. describe the role of telerehabilitation as a safe, accessible, efficient, and comfortable alternative to in-person interventions for people with spinal cord injuries.<sup>38</sup> The pandemic has also influenced bedside care. Accordingly, Farley et al. present an epidemiological profile of a pediatric hospital before and during the COVID-19 pandemic. They describe a significant decrease in the number of patients admitted for respiratory conditions and speculate the reasons for this stark change.<sup>39</sup> Another study focused on pediatric medicine was conducted by Murerwa et al.,

critically reviewing the literature on prenatal and postnatal mercury exposure due to skin lightening agents with inorganic mercury. The authors advocate that prevention is the only way to reduce mercury poisoning and toxicity.<sup>40</sup>

Patient advocacy is an important role of the medical professional, including gender diverse patients. Bonasia K, et al. highlighted differences in access to healthcare for transgender and gender-diverse patients. Their article sought to determine knowledge and perception on the subject by medical students and institutions. They conclude that clinical skills were less valued when dealing with non-binary patients as compared to a cis-gender patients.<sup>41</sup> Another point where improvement must be made in medical education is in teaching on commonly missed and misdiagnosed diseases. Urs et al. present a case on Dyke-Davidoff-Masson syndrome, a commonly missed and serious cause of refractory epilepsy which requires an understanding of pertinent imaging and clinical reasoning.<sup>42</sup> Interestingly, although ischemic heart disease is the leading global cause of death there is a lack of literature discussing the predictors of early versus late readmission to hospital following discharge for an ischemic event. Third-year medical student George Cholack et al. conducted a retrospective study of patients hospitalized for acute coronary syndrome and found that female patients were more likely to have late rehospitalization as well as non-white individuals, and those who initially required intensive care unit admission. This information can be used to inform follow-up after ischemic heart events, aiming to reduce morbidity and mortality.<sup>43</sup>

Finally, important perspectives of medical trainees are highlighted. Patricio Garcia-Espinosa shares his experience as the first cohort of undergraduates allowed to rotate in the palliative care ward in Mexico. His impactful description of the role of palliative medicine, the need for undergraduates to learn and rotate in this specialty, and its inclusion in the undergraduate curriculum is worth reflecting upon.<sup>44</sup> Similarly, Waisberg shares an experience of an "eye opening" mission trip to an underserved community in Montemorelos, Mexico that provided him new contacts, mentors, networking possibilities, and novel cultural experiences in different nations are all important insights into a specialty.<sup>45</sup> On the other side of the world, Rocha et al. describes an experience of post-graduate interns helping their community by participating in COVID-19 vaccination drives in the Philippines, gaining practical knowledge and hands-on experience.<sup>46</sup> Patel et al. also describe inaccessible and inequitable care, but for dermatological disease in underrepresented and underserved communities forming the basis of the Student Dermatological Clinic for the Underserved and a collaborative service-learning model in Pittsburgh.<sup>47</sup> Another student initiative, Mulwalkar describes the journey of creating a student-oriented research and innovation council, ASPIRE, in India.<sup>48</sup>

We hope that you enjoy reading this issue as we did in making it a reality. This is a tremendous effort of more than 70 team members volunteering to make the vision of showcasing medical students research a reality.

## References

- Bonilla-Escobar FJ, Kumar AA, Farrugia-Bonnici G, Ryan PM, Gáman MA. A Grain of Sand in the Ocean: Training New Generations of Editors, Reviewers, and Medical Scientists. *Int J Med Stud.* 2020 Sep-Dec;8(3):213-6.
- Bonilla-Velez J, Peña-Oscuivilca A, Sahin I, Córdoba-Grueso WS, Fernandez-Zapico ME. The International Journal of Medical Students, a Platform for Medical Student Research Worldwide. *Int J Med Stud* 2013;1(1):6-7.
- Verdini N, LeClair J, Quinn E, El-Haddad A. Social Determinants of Health Amplify the Association Between Ethnicity and COVID19: A Retrospective-Cohort study. *Int J Med Stud.* 2021 Sep-Dec;9(4):282-287.
- Abu-Zaid A. A graduate's perspective on medical student journals. *J Postgrad Med.* 2019 Jul-Sep;65(3):169-170.
- Corrales-Reyes I, Fornaris-Cedeño Y. [Latin American scientific student journals: A space for publishing at the undergraduate level]. *Educ Medica.* 2018 Sep;20(2): 183-185. Spanish.
- Al-Busaidi IS, Wells CI, Wilkinson TJ. Publication in a medical student journal predicts short- and long-term academic success: a matched-cohort study. *BMC Med Educ.* 2019 Jul 19;19(1):271.
- Australian Medical Student Journal. History of the AMSJ. Available from: <https://www.amsj.org/about/history>. Last updated 2022. Cited Mar 23, 2022.
- Nguyen, M. Why medical school is depressing and what we should be doing about it. *Med Stud J Aust.* 2011 March 29;2(1):65-8.
- Cureus. The Florida Medical Student Research Publication. About. Available from: <https://www.cureus.com/channels/fmsr/about>. Last Updated 2022. Cited Mar 23, 2022.
- The University of Toronto Medical Journal. About. Available from: <https://jps.library.utoronto.ca/index.php/utmj/about>. Last Updated 2022. Cited Mar 23, 2022.
- Cape JD, Beca JM, Hoch JS. Introduction to cost-effectiveness analysis for clinicians. *Univ Tor Med.* 2013 March 31;90(3):103-105.
- The International Journal of Medical Students. About. Available from: <https://www.ijms.info/IJMS/about>. Last Updated 2022. Cited Mar 23, 2022.
- 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 Stud.* 2021 Jan-Apr;9(1):25-32.
- Bawazeer NA, Alsobahi N. Prevalence and Side Effects of Energy Drink Consumption among Medical Students at Umm Al-Qura University, Saudi Arabia. *Int J Med Stud.* 2013;1(3):104-8.
- American Medical Student Research Journal. About. Available from: [https://www.amsrj.org/index.php?journal=amsrj&page=about&op=edit\\_rialPolicies#focusAndScope](https://www.amsrj.org/index.php?journal=amsrj&page=about&op=edit_rialPolicies#focusAndScope). Last Updated 2020. Cited Mar 23, 2022.
- The Cooper Rowan Medical Journal. About Us. Available from: <https://rdw.rowan.edu/crjcsmb/about.html>. Last Updated 2022. Cited Mar 23, 2022.
- Ellis, J. The " M" Word: Accusations of Malingering are Harmful to Patient Care. *Cooper Rowan Med J.* 2019 May;1(1):33-36.
- The New Zealand Medical Student Journal. About Us. Available from: <https://www.nzmsj.com/about.html>. Last Updated 2022. Cited Mar 23, 2022.
- Al-Busaidi, I, Wells, C. Stimulating the clinical academics of tomorrow: a survey of research opportunities for medical students in New Zealand. *NZ Med J.* 2017 Nov;4(25): 80-88.
- Dalhousie Medical Journal. About. Available from: <https://ojs.library.dal.ca/DMJ/about>. Last Updated 2022. Cited Mar 23, 2022.
- The University of British Columbia Medical Journal. About. Available from: <https://ubcmj.med.ubc.ca/about/>. Last Updated 2022. Cited Mar 23, 2022.
- Corrales-Reyes, I, Fornaris-Cedeño, Y. [Ranking of Latin American scientific student journals according to the h5 index]. *Educ Medica.* May-June 2019; 20(S2):181-189.
- Arman-Pereda D, Gallardo-Madrado L, Naranjo-Dominguez A, Calzada M, Arman-Alessandrini G. [TYPE 2 DIABETES MELLITUS AND RISK SCORES]. 16 de Abril. 2015 Jan 13; 54 (258): 45-55. Spanish.
- García-Rivero, A, González-Argote, J. [Cuban medical student journal in an actual context]. *Rev Med Investig.* 2017 Jan;5(1):94-98.
- The Student's Journal of Health Research Africa. About the Journal. Available from: <http://www.sjresearchafrica.org/index.php/public-html/about>. Last Updated 2022. Cited Mar 23, 2022.
- Corrales-Reyes, I, Dorta-Contreras, A. [Scientific production in Latin American student journals: comparative analysis of the period 2013-2016]. *Educ Medica.* May-June 2019; 20(3):146-154. Spanish.
- Alamri Y. How do medical student journals fare? A global survey of journals run by medical students. *Educ Health (Abingdon).* 2016 May-Aug;29(2):136-41.
- Recla, J. [One article, two articles, three articles... one hundred articles; Review of Medical Student Journals in Latin America.] *Méd UIS.* 2020 Dec;21(3):123-5. Spanish.
- Laybourn-Langton L, Smith R. COP26 and Health: Some Progress, But Too Slow and Not Enough. The Health Community Must Step Up Its Efforts to Hold Countries Accountable for Reducing Greenhouse Emissions and Promoting Adaptation. *Int J Med Stud.* 2021 Oct-Dec;9(4):255-6.
- Cox MJ, Shah PC, Komer L, Manan MR, Kutikuppala LVS, Liu B. A Call for Action—Empowering Medical Students to Facilitate Change. *Int J Med Stud.* 2021 July-Sep;9(3):187-8.
- Atwoli L, Baqui AH, Benfield T, Bosurgi R, Godlee F, Hancocks S, et al. Call for Emergency Action to Limit Global Temperature Increases, Restore Biodiversity, and Protect Health. Wealthy Nations Must Do Much More, Much Faster. *Int J Med Stud.* 2021 Jul-Sep;9(3):189-91.
- Srichawla BS, Khazeei Tabari MA, Gáman M-A, Munoz-Valencia A, Bonilla-Escobar FJ. War on Ukraine: Impact on Ukrainian Medical Students. *Int J Med Stud.* 2022 Jan-Mar;10(1):15-17.
- Montano, MA, Montano, SA, Harrison, JL, Kivisalu, TM. Reliability Generalization of the Medical Student Stressor Questionnaire. *Int J Med Stud.* 2022 Jan-Mar;10(1):25-31.
- Canton SP, Foley CE, Fulcher I, Newcomb LK, Rindos N, Donnellan NM. Reliability and Discriminant Validity of a Checklist for Surgical Scrubbing, Gowning and Gloving. *Int J Med Stud.* 2022 Jan-Mar;10(1):18-24.
- Johnson JW, Graham L, Williams E, Campbell C, Thomas N, Gossell-Williams M. Clinical Elective Choices and Motivations for Future Career Specialty Selection of Medical School Trainees and Junior Doctors of The University of the West Indies, Jamaica. *Int J Med Stud.* 2022 Jan-Mar;10(1):49-55.
- Huang JA, Dhindsa Y, Chen AJ, Wu J, Wagner JP, Tillou A, et al. Medical Student Teleconferencing Experiences and Financial Status: A Cross-Sectional Survey. *Int J Med Stud.* 2022 Jan-Mar;10(1):56-62.
- Thomas A, Shenoy MT, Kotacherry TS, Kumar SS, Sidheeque A, Khovich C, et al. Teachers' View on Online Classes during the COVID-19 Lockdown – A Cross-Sectional Study. *Int J Med Stud.* 2022 Jan-Mar;10(1):32-37.
- Park S-H, Yozbatiran N. A Medical Student's Perspective on the Growing Importance of Telemedicine/Telerehabilitation. *Int J Med Stud.* 2022 Jan-Mar;10(1):95-97.
- Farley H, Bennett H, Rao S. Rationalizing the Pediatric Emergency Department Workload: An Epidemiological Profile of Presentations Before and During the COVID-19 Pandemic. *Int J Med Stud.* 2022 Jan-Mar;10(1):69-73.
- Murerwa R, Gwala F, Amuti T, Muange M. Childhood effects of prenatal and postnatal exposure to mercurial skin lightening agents. *Literature Review.* *Int J Med Stud.* 2022 Jan-Mar;10(1):74-81.
- Bonasia, KL, Morgan A, Solomon GC, Damiano EA. Assessing Medical Students' Self-Perceived Preparedness to Care for Gender Diverse Patients: A Survey Study. *Int J Med Stud.* 2022 Jan-Mar;10(1):63-68.
- Urs GM, R. Doddabele H. Dyke-Davidoff-Masson Syndrome: A Case Report. *Int J Med Stud.* 2022 Jan-Mar;10(1):82-85.
- Cholack G, Garfein J, Krallman R, Feldeisen D, Montgomery D, Kline-Rogers E, et al. Predictors of Early (0-7 Days) and Late (8-30 Days)

- Readmission in a Cohort of Acute Coronary Syndrome Patients. *Int J Med Stud.* 2022 Jan-Mar;10(1):38-48.
44. García-Espinosa, P. Experience in a Palliative Care Unit in a Mexican Tertiary Level Hospital. *Int J Med Stud.* 2022 Jan-Mar;10(1):92-94.
45. Waisberg, E. Eye-Opening Medical Missions. *Int J Med Stud.* 2022 Jan-Mar;10(1):86-88.
46. Rocha ICN, Ramos KG, Solaiman-Balt AA, Cedeño TDD. Medical Interns as Volunteers in the COVID-19 Vaccination Drives in the Philippines. *Int J Med Stud.* 2022 Jan-Mar;10(1):89-91.
47. Patel BM, Humphrey V, James AJ. The Student Dermatology Clinic for the Underserved: A Service-Learning Model to Promote Skin Health Equity. *Int J Med Stud.* 2022 Jan-Mar;10(1):98-100.
48. Mulkalwar A. ASPIRE - A Journey from Intuition to Innovation. *Int J Med Stud.* 2022 Jan-Mar;10(1):101-103.

---

### Acknowledgments

None.

### Conflict of Interest Statement & Funding

The Authors have no conflicts of interest to disclose. Dr. Juan C. Puyana work is partially funded by the National Institute of Health (NIH) of the United States with the grant 5UG3HL151595. The opinions expressed in this article are the author's own and do not reflect the view of the National Institutes of Health, the Department of Health and Human Services, or the United States government.

### Author Contributions

Writing – Original Draft Preparation: KL, PGE, AM, SC. Writing – Review & Editing: KL, FJBE, CE, M-AG, JCP.

### Cite as

Liblik K, García-Espinosa P, Nahian A, Chatterjee S, Gáman M-A, Egan C, et al. Medical Student Research Journals: The International Journal of Medical Students (IJMS) Legacy. *Int J Med Stud.* 2022 Jan-Mar;10(1):9-14.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://open.library.pitt.edu/)



# War on Ukraine: Impact on Ukrainian Medical Students

Bahadar Singh Srichawla,<sup>1</sup> Mohammad Amin Khazeei Tabari,<sup>2</sup> Mihnea-Alexandru Găman,<sup>3</sup> Alejandro Munoz-Valencia,<sup>4</sup> Francisco J. Bonilla-Escobar.<sup>5</sup>

The ongoing Russian invasion of Ukraine has taken a tremendous toll on the physical and mental wellbeing of the Ukrainian people. Accordingly, medical trainees and institutions must adapt to a high degree of uncertainty and turmoil. The first medical school in Ukraine was the Collegium Medicum founded in 1773 in Lviv. With the fall of the Soviet Union in 1991, Ukraine had 14 medical institutes within its borders aimed at teaching students medical and pharmaceutical sciences<sup>1</sup>. In 2022, Ukraine has 23 medical institutions filled with not only Ukrainian nationals but medical students from around the world. It is estimated that approximately 18,000 students from India alone study in Ukraine, many of whom are medical learners. Medical degrees earned at Ukrainian institutions are recognized throughout the world, including by the World Health Organization (WHO) and European Council. Ukraine has accepted many foreign medical students who could not gain entry in their home countries for political reasons as well as those who could not afford the high price to study medicine in their home country.<sup>2</sup> Additionally, Ukrainian medical institutions already hosting a diverse array of trainees have had to adjust to the ongoing COVID-19 pandemic which has had a negative impact on medical education worldwide. Medical schools have resorted to virtual education and many students have been pulled out of clinical rotations for extended periods.<sup>3</sup> This stress on medical students has not been exponentially compounded by the reality of war.

Many of these national and foreign medical students are now displaced refugees looking to escape to Western Europe or their country of origin. Even by

escaping the ongoing conflict, the question remains as to how many of these students will complete their medical education and cope with the trauma of political unrest. Officials from medical universities in India have indicated accommodations will be made, however no concrete plan is currently in place. The careers of thousands of medical students remain in the balance. Although many students have been able to obtain refugee status many still await admission on the border of neighboring countries. Not only do they have to worry about the education and career, but the safety of their peers and families. Because of the ongoing conflict many of these foreign students will likely pursue their medical degrees in other countries such as Italy, Spain, and Germany. Unfortunately, emerging reports indicate that some of these emerging leaders in medicine have had their lives prematurely ended in the ongoing shelling of Ukrainian cities.<sup>4</sup> It is a true tragedy and loss to the medical community that these young students who have dedicated themselves to a field of helping others are will now never be able to realize their potential. Many of these bombardments have destroyed the key infrastructure of medical universities throughout Ukraine. The long-term effects on medical education in Ukraine are catastrophic with the lack of resources and infrastructure to support it. Tsagkaris et al. classified the consequences of the aforementioned war into four categories: physical injury and mental health consequences to Ukrainians (not only soldiers but also civilians); destruction of healthcare establishments; destruction of non-healthcare critical infrastructure; and impact on the environment (*via* the use of toxins and/or nuclear radiation during the war).<sup>5</sup>

<sup>1</sup> DO MS. Resident Physician, UMass Chan Medical School Department of Neurology, United States. Student Editor, IJMS.

<sup>2</sup> Medical student, Student Research Committee, Mazandaran University of Medical Sciences. USERN Office, Mazandaran University of Medical Sciences, Sari, Iran. Associate Editor, IJMS.

<sup>3</sup> MD, PhD student. Faculty of Medicine, "Carol Davila" University of Medicine and Pharmacy, 050474 Bucharest, Romania & Department of Hematology, Center of Hematology and Bone Marrow Transplantation, Fundeni Clinical Institute, 022328 Bucharest, Romania. Scientific Editor, IJMS.

<sup>4</sup> MD, PhD student. Institute for Clinical Research Education (ICRE), Department of Surgery, Global Surgery, University of Pittsburgh, Pittsburgh, PA, United States.

<sup>5</sup> MD, MSc, PhD(c). Researcher, Department of Ophthalmology; Institute for Clinical Research Education (ICRE), University of Pittsburgh, Pittsburgh, PA, United States. CEO, Fundación Somos Ciencia al Servicio de la Comunidad, Fundación SCISCO/Science to Serve the Community Foundation, SCISCO Foundation, Cali, Colombia. Grupo de investigación en Visión y Salud Ocular, VISOC, Universidad del Valle, Cali, Colombia. Editor in Chief, IJMS.

**Correspondence:** Bahadar Singh Srichawla. <https://orcid.org/0000-0002-5301-4102>. Address: 55 N Lake Ave, Worcester, MA 01655, United States.

Email: [Bahadar.srichawla@umassmemorial.org](mailto:Bahadar.srichawla@umassmemorial.org)

Medical students and healthcare workers will suffer tremendously from the consequences of war.

It is likely many medical students will be diverted from their studies to work on the front lines, and their medical education will be halted in Ukraine indefinitely. As the crisis continues, medical education that does occur may be restricted to online classes and will have a negative academic impact on students. Creating an environment where medical students have a stable internet connection and the resources to access their courses is essential and difficult to prioritize in these circumstances. An example of this type of scenario occurred in Iraq, 18 years ago. The political unrest in Iraq in 2003 had a negative impact on medical education. Frequent threats and attacks, accompanied by declining social order, led to the emigration of most medical professors from Iraq. This forced migration of medical professors had a great adverse effect on the leadership of the medical education system.<sup>6</sup>

The International Federation of Medical Students' Associations (IFMSA) and medical students from across the globe are calling for an immediate halt to the violence and the restoration of peace in Ukraine.<sup>7</sup> The possibility of enormous fatalities, physical damage, and relocation of citizens concerns the Ukrainians greatly. As the Russian invasion of Ukraine moves into the fifth week the stress on the Ukrainian medical system is unprecedented. From waning medical supplies, to the

lack of critical personnel including doctors and nurses, and direct assault on hospital infrastructure itself, critical intervention is needed. Willing medical students may choose to serve as frontline workers in Ukrainian hospitals. Displaced Ukrainian medical students may also serve in a safer environment, setting up relief efforts in the neighboring nations of Romania, Poland, and Hungary where many refugees have fled to. We ask medical students, health care workers, and young people around the world to stand up for peace and follow the principles of humanity, neutrality, and impartiality in their work and communication.

This is the first time that the International Journal of Medical Students Editorial Team has commented on a political conflict. We have learned in our tenure that medical students and their education worldwide is affected by many factors, including global warming and conflict. We have raised our voice before in favor of actions to prevent climate change.<sup>9-11</sup> We are adding our voice of support to those suffering from political unrest and acts of violence globally, with specific focus on the Ukraine.<sup>12</sup> The path of war and vengeance is an easy one when compared to political dialogue and collaboration. We, the new generation of scientists of the world, claim for the use of reason over emotions to keep us all safe and promote progress worldwide.

## References

1. International Encyclopedia of Ukraine. Medical Education. Available from: <http://www.encyclopediaofukraine.com/display.asp?linkpath=pages%5CM%5CE%5CMedicalEducation.htm>. Last updated: January 11th, 2021; cited: March 5th, 2022.
2. University World News. Indian medical students fleeing Ukraine demand study places. Available from: <https://www.universityworldnews.com/post.php?story=20220311110031864>. Last updated: February 10th, 2021; cited: March 12th, 2022.
3. 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 Stud*. 2002 May-Aug;8(2):92-95.
4. The Tribune. Indian Student Killed in Russian Shelling of Ukraine's Kharkiv. Available from: <https://www.tribuneindia.com/news/nation/indian-student-killed-in-russian-shelling-in-kharkiv-374150>. Last updated: March 2nd, 2022; cited: March 15th, 2022.
5. Al-Shamsi M. Medical education in Iraq: issues and challenges. *Int J Med Educ*. 2017;8:88-90.
6. Tsagkaris C, Dorosh M, Krasnova T, and Shkodina A. 2022. Diagnose the present, foretell the future: Health sequelae of the armed conflict between Russia and Ukraine. [online] Esthinktank.com. Available at: <https://esthinktank.com/2022/02/25/diagnose-the-present-foretell-the-fut...> [Accessed 28 March 2022].
7. International Federation of Medical Students Association. Medical Students Appeal for Peace in Ukraine. Available from: <https://ifmsa.org/medical-students-appeal-for-peace-in-ukraine/>. Last updated: February 26th, 2022; cited: March 13th, 2022.
8. UMass Chan Medical School. UMMS, three Boston medical schools to accelerate graduation of class of 2020. Available from: <https://www.umassmed.edu/news/news-archives/2020/03/umms-three-boston-medical-schools-to-accelerate-graduation-of-class-of-2020/>. Last updated: March 26, 2020; cited: March 15th, 2022.
9. Laybourn-Langton L, Smith R. COP26 and Health: Some Progress, But Too Slow and Not Enough. The Health Community Must Step Up Its Efforts to Hold Countries Accountable for Reducing Greenhouse Emissions and Promoting Adaptation. *Int J Med Stud*. 2021 Oct-Dec;9(4):255-6.
10. Cox MJ, Shah PC, Komer L, Manan MR, Kutikuppala LVS, Liu B. A Call for Action—Empowering Medical Students to Facilitate Change. *Int J Med Stud*. 2021 July-Sep;9(3):187-8.



11. Atwoli L, Baqui AH, Benfield T, Bosurgi R, Godlee F, Hancocks S, et al. Call for Emergency Action to Limit Global Temperature Increases, Restore Biodiversity, and Protect Health. Wealthy Nations Must Do Much More, Much Faster. *Int J Med Stud.* 2021 Jul-Sep;9(3):189-91.
12. Liblik K, Garcia-Espinosa P, Nahian A, Chatterjee S, Gãman M-A, Egan C, et al. Medical Student Research Journals: The International Journal of Medical Students (IJMS) Legacy. *Int J Med Stud.* 2022 Jan-Mar;10(1):9-14.

---

**Acknowledgments**

None.

**Conflict of Interest Statement & Funding**

The Authors have no conflicts of interest to disclose. Dr. Alejandro Munoz-Valencia work is partially funded by the National Institute of Health (NIH) of the United States with the grant 5UG3HL151595. The opinions expressed in this article are the author's own and do not reflect the view of the National Institutes of Health, the Department of Health and Human Services, or the United States government.

**Author Contributions**

Writing – Original Draft Preparation: BSS, MAKT, FJBE. Writing – Review & Editing: FJBE, AMV.

**Cite as**

Srichawla BS, Khazeei Tabari MA, Gãman M-A, Munoz-Valencia A, Bonilla-Escobar FJ. War on Ukraine: Impact on Ukrainian Medical Students. *Int J Med Stud.* 2022 Jan-Mar;10(1):15-17.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://open.library.pitt.edu/)



# Reliability and Discriminant Validity of a Checklist for Surgical Scrubbing, Gowning and Gloving

Stephen P. Canton,<sup>1</sup> Christine E. Foley,<sup>2</sup> Isabel Fulcher,<sup>3</sup> Laura K. Newcomb,<sup>4</sup> Noah Rindos,<sup>5</sup> Nicole M. Donnellan.<sup>6</sup>

## Abstract

**Background:** Surgical scrubbing, gowning, and gloving is challenging for medical trainees to learn in the operating room environment. Currently, there are few reliable or valid tools to evaluate a trainee's ability to scrub, gown and glove. The objective of this study is to test the reliability and validity of a checklist that evaluates the technique of surgical scrubbing, gowning and gloving (SGG). **Methods:** This Institutional Review Board-approved study recruited medical students, residents, and fellows from an academic, tertiary care institution. Trainees were stratified based upon prior surgical experience as novices, intermediates, or experts. Participants were instructed to scrub, gown and glove in a staged operating room while being video-recorded. Two blinded raters scored the videos according to the SGG checklist. Reliability was assessed using the intraclass correlation coefficient for total scores and Cohen's kappa for item completion. The internal consistency and discriminant validity of the SGG checklist were assessed using Cronbach alpha and the Wilcoxon rank sum test, respectively. **Results:** 56 participants were recruited (18 novices, 19 intermediates, 19 experts). The intraclass correlation coefficient demonstrated excellent inter-rater reliability for the overall checklist (0.990), and the Cohen's kappa ranged from 0.598 to 1.00. The checklist also had excellent internal consistency (Cronbach's alpha 0.950). A significant difference in scores was observed between all groups ( $p < 0.001$ ). **Conclusion:** This checklist demonstrates a high inter-rater reliability, discriminant validity, and internal consistency. It has the potential to enhance medical education curricula.

**Key Words:** Medical Education; Surgery; Augmented Reality; Virtual Reality (Source: MeSH-NLM).

## Introduction

Surgical scrubbing, gowning and gloving (SGG) are fundamental skills required to safely participate in surgery. These skills are challenging for medical trainees to master due to the learning environment in the operating room (OR). The rapid pace, limited time, and unavailability of expert medical professionals to provide training, hierarchy and the pressure of the high-stakes clinical environment are contributing factors to the OR culture.<sup>1-4</sup> Such factors obstruct trainee skill acquisition and increase trainee stress, which negatively impacts the learning environment in the OR.<sup>1,4-6</sup> Simulation-based education is rapidly gaining momentum, aligning with the paradigm shift in medical education as it transitions from "see one, do one, teach one" to a deliberate practice model.<sup>4-7</sup> A SSG simulation model can provide an opportunity to prepare students and mitigate stress while in the OR.

The first step in developing simulation or assessment tools is formulating the content of the training that underlies the

instruction. Checklists are commonly used in medical education to evaluate clinical skills in a simulated environment.<sup>7-11</sup> Checklists standardize procedural training, provide an objective assessment to track progression, and can be used as an assessment tool to determine competency or suggest remediation.<sup>12</sup> Educational checklists have high inter-rater reliability and trainee discrimination which allows for quality feedback for the learner. Compared to global rating scales, checklists have also been shown to require less rater training.<sup>13</sup>

There are very few reliable or valid tools for evaluating a trainee's ability to scrub, gown and glove,<sup>14</sup> and the few published studies lack methodologic rigor justifying the development of procedural checklists.<sup>3,15,16</sup> The objective of this study was to assess the reliability and validity of this SGG checklist by assessing inter-rater reliability, internal consistency, and construct (discriminant) validity. We hypothesize that this tool will be able to detect a difference in skills between learners with different levels of surgical experience.

<sup>1</sup> MD, MSc, MSc, Department of Orthopaedic Surgery, University of Pittsburgh School of Medicine, UPMC, Pittsburgh, United States

<sup>2</sup> MD, Department of Obstetrics and Gynecology, The Warren Alpert Medical School of Brown University, Providence, RI, United States

<sup>3</sup> Ph.D. Department of Global Health and Social Medicine, Harvard Medical School, Boston, MA, United States

<sup>4</sup> MD, Department of Obstetrics and Gynecology, University of Virginia School of Medicine, Charlottesville, VA, United States

<sup>5</sup> MD, Department of Obstetrics and Gynecology, Allegheny General Hospital, Pittsburgh, PA, United States

<sup>6</sup> MD, Department of Obstetrics, Gynecology and Reproductive Sciences, UPMC Magee-Womens Hospital, Pittsburgh, PA, United States

**About the Author:** Stephen P. Canton is a recent graduate of University of Pittsburgh School of Medicine in Pittsburgh, PA (class of 2021). He is a recipient of Clinical Scientist Training Program scholarship (MD/MS physician-scientist program), Bert and Sally O'Malley Award for Outstanding Medical Student Research, Harold Henderson Sankey MD Award for Excellence in Orthopaedic Surgery, and Antwon Rose II Award for Excellence in Community Engagement.

## Correspondence:

Stephen P. Canton. <https://orcid.org/0000-0002-9928-575X>

Address: 200 Lothrop St, Pittsburgh, PA, 15213, United States

Email: [stephenpaulcanton@gmail.com](mailto:stephenpaulcanton@gmail.com)

Editor: Francisco J. Bonilla-Escobar  
Student Editors: Nikoleta Tellios & Purva Shah  
Copyeditor: Adnan Mujanovic  
Proofreader: Madeleine J. Cox  
Layout Editor: Francisco J. Bonilla-Escobar

Submission: Sep 27, 2021  
Revisions: Oct 20, 2021  
Received: Nov 22, 2021  
Acceptance: Nov 22, 2021  
Publication: Nov 23, 2021  
Process: Peer-reviewed

## Methods

### Study Design and Participants

This is a cross-sectional study to assess the validity and repeatability of a checklist created to evaluate effective scrubbing, gowning and gloving in the operating room setting (**Table 1**).<sup>17</sup> A single operating room at a Level I trauma center was used for all data collection. The operating room adhered to national standards and guidelines (including the scrub sink outside of the room). Approved surgical attire were available, including surgical scrub brushes (Becton, Dickinson and Company, Franklin Lakes, New Jersey), surgical gowns (O&M Halyard, Inc., Alpharetta, Georgia), and surgical gloves (Cardinal Health, Dublin, Ohio). The individuals recruited consisted of medical students from the affiliated nationally renowned medical school with approximately 150 students per class – all of whom complete the surgical clerkships – and surgical residents, fellows and attendings from a wide variety of specialties. In the first phase of this research project, the modified Delphi technique was utilized to establish content validity and develop a checklist of 22 items for the process of surgical SGG.<sup>17,18</sup>

Participants were recruited and classified into three groups based upon prior surgical experience. Novices were defined as preclinical medical students with less than 8 weeks of surgical experience, intermediates were clinical medical students with at least 8 weeks of surgical experience and experts were residents or fellows with at least 6 months of postgraduate surgical training. Participants were recruited via email. A convenience sample of 20 participants per experience level was determined based on institution feasibility and similar previously reported studies.<sup>11,19-21</sup> After obtaining informed consent, each study participant was assigned a unique study ID and completed a pre-test survey on demographics and prior surgical experience. The participant was then instructed to scrub, gown and glove in a staged inpatient operating room. The participants were not given any instruction or guidance on the task nor did they see the SGG checklist prior to performing the task. A scrub technician donned in surgical attire was available for the gowning and gloving portion of each trial. All necessary equipment was present at the scrub sink and with the scrub technician in the OR. Every participant was instructed to ask the scrub technician for each individual piece of equipment necessary to complete the task (towel, gown, gloves, etc.).

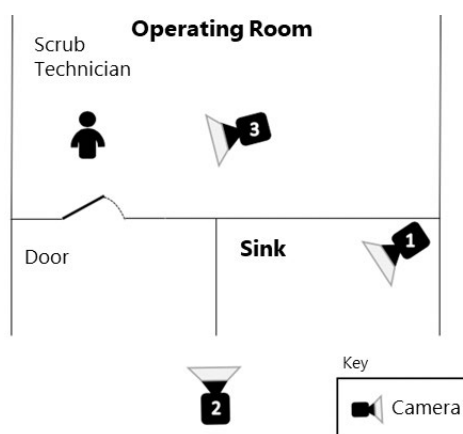
### Data Collection and Analysis

Three cameras were placed to capture the entire procedure (**Figure 1**), including two outside the operating room at the scrub sink and one within the operating room. Participants were aware they were being video-recorded. The study investigators reviewed all recordings in order to render the videos de-identifiable by removing sound and facial features, while still capturing sufficient area above the neck to allow raters to assess if a mask was donned. Data collection occurred over a period of three months (February 2019 to May 2019).

**Table 1.** Scrubbing, Gowning and Gloving (SGG) Checklist.

| Scrubbing  |
|--|
| 1. Remove all jewelry  |
| 2. Put on face mask  |
| 3. Grab a pre-package scrub/nail kit   |
| 4. Moisten hands and arms under the water without touching the faucet                                |
| 5. Use firm/bristled side of brush to scrub nails  |
| 6. Use firm/bristled end of scrub brush to scrub all surfaces of fingers                             |
| 7. Use sponge to scrub the entire length of forearm, starting most distal (wrist) to elbow           |
| 8. Use sponge to scrub entire length of contralateral forearm, starting most distal (wrist) to elbow |
| 9. Rinse off both arms   |
| 10. Use back/butt/hip to enter OR  |
| 11. Gowning and Gloving  |
| 12. Enter OR with elevated hands/arms taking care to avoid touching anything                         |
| 13. Hold out one hand to accept a dry towel from scrub tech/nurse                                    |
| 14. Dry opposite hand/arm using the hand the towel was placed in                                     |
| 15. Dry opposite hand/arm that has not yet been dried  |
| 16. With scrub tech/nurse holding gown open, place both hands/arms into sleeves                      |
| 17. Allow nonsterile nurse/circulator to tie up back of gown   |
| 18. With scrub tech/nurse holding right glove open, put hand into right glove                        |
| 19. With scrub tech/nurse holding left glove open, put left hand into glove                          |
| 20. Hand card to scrub tech/nurse or circulator  |
| 21. Rotate in gown with scrub tech/nurse or circulator still holding card                            |
| 22. Regrasp the tie from the scrub tech/nurse or circulator  |
| 23. Tie both ties of gown together   |

**Figure 1.** Schematic of Study Setup.



**Legend:** Three cameras were placed to capture the entire procedure, including two outside the operating room at the scrub sink (Camera 1 and Camera 2) and one within the operating room (Camera 3). A scrub technician awaited inside the room for the gowning and gloving portion of the simulation.

Individual videos were scored according to the SGG checklist by two blinded raters with extensive surgical expertise. Both raters served as faculty in minimally invasive gynecologic surgery, with 6 and 9 years of surgical experience, respectively. Prior to rating the study videos, both surgeons were oriented to the study and SGG checklist by study personnel. The raters were provided with a written copy of the SGG checklist and a training video that described the correct steps and skills. Raters were blinded to subjects' identity and prior surgical experience. Each rater watched the videos and graded the participants' scrubbing, gowning, and gloving performance according to the SGG checklist. The checklist is dichotomous, with steps appearing as "performed / not performed" (Table 1). If needed, the rater had the ability to stop, pause or rewind the video and watch again to ensure that the proper value was assigned to each step. All video scores and pre-study surveys were uploaded according to the assigned study ID to Research Electronic Data Capture (REDCap), a secure, web-based software platform for research studies (v 9.7.8).

For each participant, the completed SGG checklist items were summed to create an overall test score with a maximum value of 22. To assess inter-rater reliability of the overall test scores, we computed the intraclass correlation coefficient (ICC) from a mixed effects model with random effects for the subjects.<sup>22</sup> ICC values range between 0 and 1, with less than 0.5 indicating poor reliability, between 0.5 and 0.75 indicating moderate reliability, values between 0.75 and 0.9 indicating good reliability, and values greater than 0.90 indicating excellent reliability.<sup>23</sup> We also computed Cohen's kappa ( $\kappa$ ) to assess inter-rater reliability for each checklist item which should be interpreted as follows: values  $\leq 0$  indicate no agreement and 0.01-0.20 as none to slight, 0.21-0.40 as fair, 0.41-0.60 as moderate, 0.61-0.80 as substantial, and 0.81-1.00 as almost perfect agreement.<sup>24, 25</sup>

For the remaining analyses, we used the average of the reviewers' scores for each participant. Cronbach's alpha ( $\alpha$ ) was computed to determine the relatedness of the SGG checklist items or internal consistency of the test.<sup>26</sup> The Cronbach's  $\alpha$  values for dichotomous checklists are interpreted as:  $\alpha \geq 0.7$  as acceptable,  $0.8 \geq \alpha \geq 0.9$  as good, and  $\alpha \geq 0.9$  indicates high internal consistency.<sup>27</sup> For each checklist item, we calculated the correlation between the individual item completion (averaged) and the test score (without the checklist item) to evaluate construct validity via Spearman rank correlation coefficient, which is a nonparametric measure of rank correlation. Correlations lower than 0.40, between 0.40 and 0.70, and greater than 0.70 were considered as weak, moderate and strong, respectively. The Wilcoxon rank sum test was used to determine discrimination validity of the overall test scores between all pairwise combinations of the novice, intermediate, and expert groups. Statistical analyses were performed using R software V3.6.0.

### Ethical Consideration

Formal approval for the study was obtained from the University of Pittsburgh School of Medicine's Institutional Review Board (STUDY18100095). All students were invited to participate after

providing informed consent. Confidentiality was maintained as no identifying information (only randomly assigned, non-consecutive Study ID numbers) was collected during the survey. The study code was kept on a password protected computer only accessible by the primary investigator.

## Results

### Demographics

We recruited 56 participants for this study including 18 novices, 19 intermediates and 19 experts (Table 2). 4 videos were excluded due to incidental incomplete captures during data collection (2 novice, 1 intermediate, and 1 expert). All of the novices reported scrubbing in  $\leq 5$  surgeries, 95% of intermediates reported scrubbing into 6-100 surgeries (5% scrubbed into  $\geq 100$ ), and all the experts reported scrubbing in  $\geq 100$  surgeries. Seventy percent of the experts reported confidence in the task, as opposed to only 11% of novices and intermediates.

Table 2. Baseline Demographic Variables.

| Variable   | Overall (n=56) | Novice (n=18) | Intermediate (n=19) | Expert (n=19) |
|--|----------------|---------------|---------------------|---------------|
| Age median   | 27             | 25            | 27                  | 29            |
| Male, n (%)  | 23 (41%)       | 8 (44%)       | 12 (63%)            | 3 (16%)       |
| Number of surgeries, n (%)   |                |               |                     |               |
| 0-5  | 18 (32%)       | 18 (100%)     | 0 (0%)              | 0 (0%)        |
| 6-25   | 3 (5%)         | 0 (0%)        | 3 (16%)             | 0 (0%)        |
| 26-50  | 6 (11%)        | 0 (0%)        | 6 (32%)             | 0 (0%)        |
| 51-100   | 9 (16%)        | 0 (0%)        | 9 (47%)             | 0 (0%)        |
| 101+   | 21 (37%)       | 0 (0%)        | 1 (5%)              | 20 (100%)     |
| I feel confident about my ability to scrub, n (%)                      |                |               |                     |               |
| Disagree or Strongly Disagree  | 21 (37%)       | 15 (83%)      | 4 (21%)             | 2 (10%)       |
| Neutral  | 18 (32%)       | 1 (6%)        | 13 (68%)            | 4 (20%)       |
| Agree or Strongly Agree  | 18 (32%)       | 2 (11%)       | 2 (11%)             | 14 (70%)      |
| I think the operating room is a comfortable learning environment n (%) |                |               |                     |               |
| Disagree or Strongly Disagree  | 21 (37%)       | 9 (50%)       | 5 (26%)             | 2 (10%)       |
| Neutral  | 18 (32%)       | 6 (33%)       | 10 (53%)            | 8 (40%)       |
| Agree or Strongly Agree  | 18 (32%)       | 3 (17%)       | 4 (21%)             | 10 (50%)      |
| Has surgical career interest, n (%)                                    |                |               |                     |               |
| I don't know   | 5 (9%)         | 5 (28%)       | 0 (0%)              | 0 (0%)        |
| No   | 14 (25%)       | 4 (22%)       | 10 (53%)            | 0 (0%)        |
| Yes  | 38 (67%)       | 9 (50%)       | 9 (47%)             | 20 (100%)     |

### Reliability Outcome Measures (ICC, Cohen's $\kappa$ , Spearman rank correlation coefficient)

The proportion of times the checklist item was marked completed by reviewers is demonstrated in Figure 2. The intraclass correlation coefficient was 0.990 (95% CI: [0.983, 0.994])

indicating a high level of agreement between reviewers. The inter-rater reliability for each item measured by Cohen's  $\kappa$  ranged from 0.598 (scrubbing nails) to 1.00 (multiple measures) (Figure 3). Of note, two measures related to gloving were excluded, as they had no variation in completion. Further, the Spearman rank correlation coefficient of each checklist item and the overall score ranged from 0.351 to 0.801, with the gloving measures also excluded from this analysis (Figure 4). Of the remaining 20 checklist items, 11 demonstrated moderate correlation and 8 demonstrated strong correlation. This indicates that the checklist has a moderate to high level of construct validity.

### Validity Outcome Measures (Cronbach $\alpha$ and Wilcoxon rank sum test)

The internal consistency of the test measured by Cronbach's  $\alpha$  was 0.950 (95% CI [0.944, 0.952]), indicating a high level of correlation among test items. The overall median test score was 19.7 with an interquartile range of 11.4-21.1. The median test score was 9 among novices, 20 among intermediates, and 21.5 among experts (Figure 5). There was greater variability in scores among the novices than the intermediates and experts. All groups differed significantly in the distributions of their test scores.

### Discussion

We found that our 22-item, task-based SGG checklist demonstrates good reliability and discriminant validity. This checklist has a high inter-rater reliability and good internal consistency. Inter-rater reliability measures the level of agreement between independent observers. It reveals unambiguity of the checklist and the optimization of its practical use by minimizing the effect of the observer variability. The SGG checklist also demonstrates discriminant validity by detecting a difference in skills between learners with different levels of surgical experience. Good discriminant validity, a subtype of construct validity, ascertains whether two supposedly unrelated constructs are actually unrelated.

The ICC (0.99) indicates excellent overall inter-rater reliability of the checklist. The item inter-rater reliability was  $> 0.6$  for all items, with 82% of the items  $> 0.8$ , indicating that there was substantial to near perfect agreement for many of the checklist items. Item discrimination is typically low for easy and difficult checklist items because all participants perform similarly on them. Two of the items (right and left glove) were excluded for this reason; there was no variation because every participant completed the item. The SGG checklist demonstrates discriminant validity by detecting a difference in skill between all three groups, particularly for novices compared to intermediates and experts (Figure 5). This result provides some support for construct validity, which is an important step in the initial evaluation of an assessment tool and internal validity. Further, the Cronbach  $\alpha$  was above the traditional cutoff of 0.7,<sup>27,28</sup> suggesting excellent internal consistency.

To our knowledge, this is the first study to assess the reliability

and discriminant validity of a developed, consensus-based checklist for the skill of scrubbing, gowning and gloving. Current methods of teaching include formal instruction prior to clinical rotations, detailed written protocols and videos of the process.<sup>2,3</sup> Other resources are available online, such as guidelines from the Association of PeriOperative Registered Nurses, however the references are only accessible via paid membership.<sup>29</sup> Pirie et al. provides a 6-step hand washing and gowning and gloving method, but the discrete steps for gowning and gloving are not provided.<sup>2,3</sup> Additionally, the methods mentioned only serve to inform students; there are no resources available that provide preparation or standardized assessment of students' understanding of the procedures.<sup>30</sup>

Figure 2. Proportion of Participants that Completed Checklist Items (as Evaluated by Reviewers).

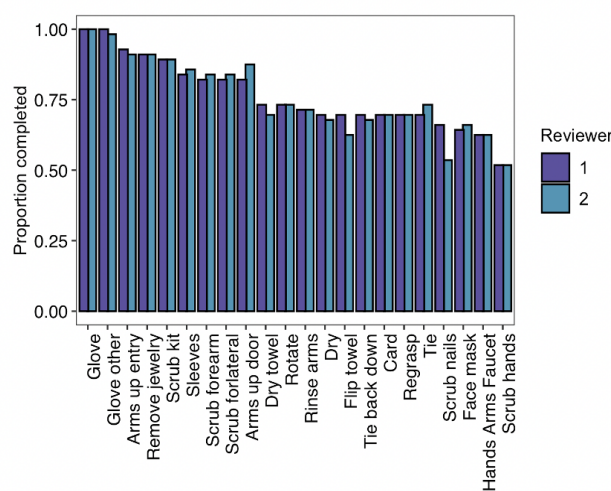
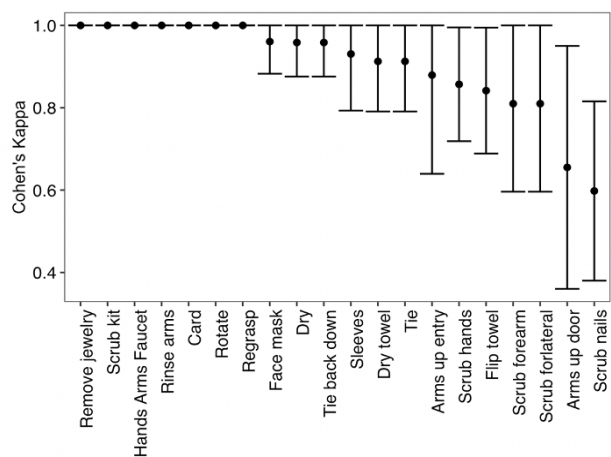
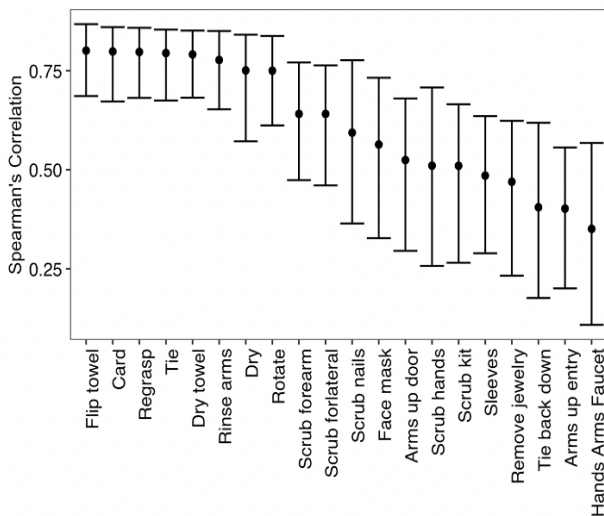


Figure 3. Cohen's Kappa ( $\kappa$ ) with 95% Confidence Intervals to assess Inter-rater Reliability for each Checklist Item.



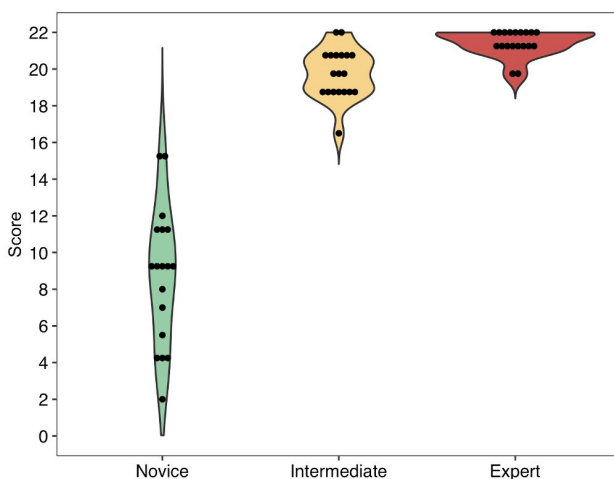
Legend: Values  $\leq 0$  indicate no agreement. Values 0.01-0.20 are interpreted as none to slight, 0.21-0.40 as fair, 0.41-0.60 as moderate, 0.61-0.80 as substantial, and 0.81-1.00 as almost perfect agreement.

**Figure 4.** Spearman Rank Correlation Coefficient with 95% Confidence Intervals for each Checklist Item.



**Legend:** The individual item completion (averaged) and the test score (without the checklist item) were correlated via the Spearman rank correlation coefficient to evaluate construct validity. Correlations lower than 0.40, between 0.40 and 0.70, and greater than 0.70 were considered as weak, moderate and strong, respectively.

**Figure 5.** Distribution of Overall Test Scores by Expertise Level.



**Legend:** The median test score was 9 among novices, 20 among intermediates, and 21.5 among experts. There was greater variability in scores among the novices than the intermediates and experts. All groups differed significantly in the distributions of their test scores (pairwise p-values all <0.001).

Our results show that novices have a significantly lower baseline skillset (median score of 9) compared to intermediates and experts (median score of 20 and 21.5, respectively). This suggests that the implementation of this SGG checklist would be effective for both learning and assessment. Medical students could benefit from a simulation model informed by the SGG checklist at the

start of their clerkship rotations. There is evidence that providing simulation education prior to OR experiences give students increased confidence and comfort,<sup>15,31-33</sup> which can mitigate stress that hinder learning.<sup>4-6</sup> As an assessment tool, the SGG checklist can be used within curriculums after surgical clerkships via objective structured clinical examinations (OSCEs). Post-clerkship, students would be expected to perform at an expert level to pass.

While our checklist demonstrates good reliability and validity, it is important to recognize the tradeoffs between checklists and global rating scales (GRSs) in medical education. The advantages and disadvantages of each have long been debated.<sup>13,34-37</sup> In general, checklists assess *whether or not the task was done* (washed hands), whereas rating scales assess *how well tasks were performed* (washed hand in fluent, efficient manner).<sup>35</sup> Checklists are advantageous for their ease-of-use and the step-by-step nature makes them particularly useful for raters that are less familiar with the evaluated skill.<sup>38</sup> Although checklists seem to be a more objective measure, there is some evidence that the dichotomous nature of checklists may result in a loss of information, and may prioritize thoroughness over clinical competence.<sup>34,39-43</sup> GRSs are more sensitive for detecting differing levels of experience and allow raters to have more flexibility on the assessment of more complex, diverse tasks.<sup>44-47</sup> An accurate global assessment requires rater judgements and decision-making, rendering it dependent upon rater characteristics (clinical expertise and familiarity) and task complexity.<sup>48-50</sup> This may be disadvantageous in a high-stakes assessment setting.<sup>48,49</sup> In a systematic review comparing global rating scales versus checklists in simulation-based assessments, interrater reliability was high (similar to our study) and slightly better for checklists, without differences in discrimination and correlation with other measures.<sup>13</sup> They also reported that GRS are useful for assessment across multiple tasks (such as an OSCE), with high average inter-item and inter-station reliability.<sup>13</sup> A checklist is ideal for evaluation of SGG because it is a single task that does not require a high level of rater expertise.

Our study has many strengths. The SGG checklist was developed using the Delphi technique in our prior study,<sup>17</sup> a widely accepted technique in medical education and quality improvement.<sup>51-53</sup> The reviewers were blinded and were provided de-identified videos to minimize bias. An actual, functioning OR setting was used to increase the strength of study, specifically external validity. The expertise groups were well-distributed, and the survey characteristics also correlated well with surgical expertise. While the term *validity* must be used cautiously in the realm of medical education,<sup>44,54-55</sup> our results show that the SGG checklist is able to discriminate between learners of novice, intermediate, and expert level.

Limitations of our study include the single-center design which decreases external validity. Use of a convenience sample can potentially introduce a selection bias if factors leading to

participation affected the checklist performance. However, study participants were stratified based on experience alone and the study should be minimally affected by this sampling method. Also, the study has potential inherent Hawthorne bias given that they participants were aware that they were being evaluated and recorded. Our checklist does not take into account the weight of particular items because failure of any one of the items on the SGG checklist should equate to overall failure in the pre-operative setting. This is particularly important for scrubbing, gowning and gloving because failure warrants immediate restart of the process (i.e., re-scrub, gown and glove).

We describe the development of a reliable and valid SGG checklist intended to enhance medical education curricula, specifically to inform a simulated scrubbing, gowning and gloving activity. There is also evidence that this can be used as an assessment tool within an OSCE or other standardized medical education exams. Future steps include further validation (criterion, convergent and predictive) of the SGG checklist, multi-center testing, and implementation into a medical education curriculum.

## References

- Park J, MacRae H, Musselman LJ, Rossos P, Hamstra SJ, Wolman S, et al. Randomized controlled trial of virtual reality simulator training: transfer to live patients. *Am J Surg*. 2007 Aug;194(2):205-11.
- Pirie S. Surgical gowning and gloving. *J Perioper Pract*. 2010 Jun;20(6):207-9.
- Pirie S. Hand washing and surgical hand antisepsis. *J Perioper Pract*. 2010 May;20(5):169-72.
- Samia H, Khan S, Lawrence J, Delaney CP. Simulation and its role in training. *Clin Colon Rectal Surg*. 2013 Mar;26(1):47-55.
- Hampton BS, Craig LB, Abbott JF, Buery-Joyner SD, Dalrymple JL, Forstein DA, et al. To the point: teaching the obstetrics and gynecology medical student in the operating room. *Am J Obstet Gynecol*. 2015 Oct;213(4):464-8.
- Kanumuri P, Ganai S, Wohaibi EM, Bush RW, Grow DR, Seymour NE. Virtual reality and computer-enhanced training devices equally improve laparoscopic surgical skill in novices. *JLS*. 2008 Jul-Sep;12(3):219-26.
- Berg K, Berg D, Riesenber LA, Mealey K, Schaeffer A, Weber D, et al. The development of validated checklist for Foley catheterization: preliminary results. *Am J Med Qual*. 2013 Nov-Dec;28(6):519-24.
- Berg K, Riesenber LA, Berg D, Schaeffer A, Davis J, Justice EM, et al. The development of a validated checklist for radial arterial line placement: preliminary results. *Am J Med Qual*. 2014 May-Jun;29(3):242-6.
- Cook DA, Beckman TJ. Current concepts in validity and reliability for psychometric instruments: theory and application. *Am J Med*. 2006 Feb;119(2):166 e7-16.
- Grant EC, Grant VJ, Bhanji F, Duff JP, Cheng A, Lockyer JM. The development and assessment of an evaluation tool for pediatric resident competence in leading simulated pediatric resuscitations. *Resuscitation*. 2012 Jul;83(7):887-93.
- van der Heide PA, van Toledo-Eppinga L, van der Heide M, van der Lee JH. Assessment of neonatal resuscitation skills: a reliable and valid scoring system. *Resuscitation*. 2006 Nov;71(2):212-21.
- Baez J, Powell E, Leo M, Stolz U, Stolz L. Derivation of a procedural performance checklist for ultrasound-guided femoral arterial line placement using the modified Delphi method. *J Vasc Access*. 2020 Sep;21(5):715-22.
- Ilgel JS, Ma JW, Hatala R, Cook DA. A systematic review of validity evidence for checklists versus global rating scales in simulation-based assessment. *Med Educ*. 2015 Feb;49(2):161-73.
- Hasty BN, Lau JN, Tekian A, Miller SE, Shipper ES, Berekynei Merrell S, et al. Validity Evidence for a Knowledge Assessment Tool for a Mastery Learning Scrub Training Curriculum. *Acad Med*. 2020 Jan;95(1):129-35.
- Barnum TJ, Salzman DH, Odell DD, Even E, Reczynski A, Corcoran J, et al. Orientation to the Operating Room: An Introduction to the Surgery Clerkship for Third-Year Medical Students. *MedEdPORTAL*. 2017 Nov 14;13:10652.
- Jeyakumar A, Sabu S, Segeran F. Adequacy of Scrubbing, Gowning and Gloving Among Operating room Nurses. *IOSR Journal of Nursing and Health Science*. 2017;6(1):61-4.
- Canton S, Foley C, Donnellan N. Development of Surgical Scrubbing, Gowning and Gloving Checklist using the Delphi Method. *MedEdPublish*. 2020 Mar 26;9.
- Stufflebeam DL. Guidelines for developing evaluation checklists: the checklists development checklist (CDC). Kalamazoo, MI: The Evaluation Center Retrieved on January 16 2000.
- Dong Y, Suri HS, Cook DA, Kashani KB, Mullon JJ, Enders FT, et al. Simulation-based objective assessment discerns clinical proficiency in central line placement: a construct validation. *Chest*. 2010 May;137(5):1050-6.
- Hanlon C, Medhin G, Alem A, Araya M, Abdulahi A, Hughes M, et al. Detecting perinatal common mental disorders in Ethiopia: validation of the self-reporting questionnaire and Edinburgh Postnatal Depression Scale. *J Affect Disord*. 2008 Jun;108(3):251-6.
- Murphy SP, Kaiser LL, Townsend MS, Allen LH. Evaluation of validity of items for a food behavior checklist. *J Am Diet Assoc*. 2001 Jul;101(7):751-61.
- Hallgren KA. Computing Inter-Rater Reliability for Observational Data: An Overview and Tutorial. *Tutor Quant Methods Psychol*. 2012;8(1):23-34.
- Portney LG, Watkins MP. *Foundations of clinical research: applications to practice*. Upper Saddle River, New Jersey: Pearson/Prentice Hall; 2009.
- Cohen J. A coefficient of agreement for nominal scales. *Educational and psychological measurement*. 1960 Apr;20(1):37-46.
- McHugh ML. Interrater reliability: the kappa statistic. *Biochemia medica*. 2012 Oct 15; 22(3):276-82.
- Cronbach LJ. Coefficient alpha and the internal structure of tests. *psychometrika*. 1951 Sep;16(3):297-334.
- Tavakol M, Dennick R. Making sense of Cronbach's alpha. *International journal of medical education*. 2011;2: 53.
- Nunnally JC, Bernstein IH. *Psychometric Theory*. 3rd ed. New York: McGraw-Hill; 1994.
- Association of periOperative Registered Nurses (AORN). Available from: <https://www.aorn.org/guidelines/about-aorn-guidelines>. Last updated August 15, 2019; cited September 10 2019.
- United States Medical Licensing Examination (USMLE). Step 2 CS. Available from: <https://www.usmle.org/step-2-cs/>. Last updated July 1 2019; cited July 18, 2019.
- Mohan S, Follansbee C, Nwankwo U, Hofkosh D, Sherman FS, Hamilton MF. Embedding patient simulation in a pediatric cardiology rotation: a unique opportunity for improving resident education. *Congenit Heart Dis*. 2015 Jan-Feb;10(1):88-94.
- Sperling JD, Clark S, Kang Y. Teaching medical students a clinical approach to altered mental status: simulation enhances traditional curriculum. *Med Educ Online*. 2013 Apr 3;18:1-8.

33. Dayal AK, Fisher N, Magrane D, Goffman D, Bernstein PS, Katz NT. Simulation training improves medical students' learning experiences when performing real vaginal deliveries. *Simul Healthc.* 2009 Fall;4(3):155-9.
34. Hodges B, McNaughton N, Tiberius R. OSCE checklists do not capture increasing. *Acad Med.* 1999;74:1129-3.
35. Reronr R. Comparing the psychometric properties of checklists and global rating scales for assessing performance on an GSCE-format examination. *Acad Med.* 1998;73:993-7.
36. Ringsted C, Ostergaard D, Ravn L, Pedersen JA, Berlac PA, van der Vleuten CP. A feasibility study comparing checklists and global rating forms to assess resident performance in clinical skills. *Med Teach.* 2003 Nov;25(6):654-8.
37. van der Vleuten CP, Swanson DB. Assessment of clinical skills with standardized patients: state of the art. *Teaching and Learning in Medicine: An International Journal.* 1990 Jan 1;2(2):58-76.
38. Archer JC. State of the science in health professional education: effective feedback. *Medical education.* 2010 Jan;44(1):101-8.
39. Cunnington JP, Neville AJ, Norman GR. The risks of thoroughness: Reliability and validity of global ratings and checklists in an OSCE. *Adv Health Sci Educ Theory Pract.* 1996 Jan 1;1(3):227-33.
40. Norman G. Editorial—checklists vs. ratings, the illusion of objectivity, the demise of skills and the debasement of evidence. *Advances in Health Sciences Education.* 2005 Mar 1;10(1):1-3.
41. Norman G, Van der Vleuten C, De Graaff E. Pitfalls in the pursuit of objectivity: issues of validity, efficiency and acceptability. *Medical education.* 1991 Mar;25(2):119-26.
42. trainer DL. Statistics Commentary Series: Commentary No. 20: Statistical Significance and Practical Importance. *Journal of clinical psychopharmacology.* 2017 Jun 1;37(3):287-8.
43. Van der Vleuten C, Norman G, De Graaff E. Pitfalls in the pursuit of objectivity: issues of reliability. *Medical education.* 1991 Mar;25(2):110-8.
44. Eva KW, Hodges BD. Scylla or Charybdis? Can we navigate between objectification and judgement in assessment? *Medical education.* 2012 Sep;46(9):914-9.
45. Govaerts MJ, Van der Vleuten CP, Schuwirth LW, Muijtjens AM. Broadening perspectives on clinical performance assessment: rethinking the nature of in-training assessment. *Advances in health sciences education.* 2007 May;12(2):239-60.
46. Hodges B, McLroy JH. Analytic global OSCE ratings are sensitive to level of training. *Medical education.* 2003 Nov;37(11):1012-6.
47. Schuwirth LW, van der Vleuten CP. A plea for new psychometric models in educational assessment. *Medical education.* 2006 Apr;40(4):296-300.
48. Holmboe ES, Hawkins RE, Huot SJ. Effects of training in direct observation of medical residents' clinical competence: a randomized trial. *Annals of internal medicine.* 2004 Jun 1;140(11):874-81.
49. Kogan JR, Hess BJ, Conforti LN, Holmboe ES. What drives faculty ratings of residents' clinical skills? The impact of faculty's own clinical skills. *Academic Medicine.* 2010 Oct 1;85(10):S25-S8.
50. Lievens F. Assessor training strategies and their effects on accuracy, interrater reliability, and discriminant validity. *Journal of Applied Psychology.* 2001 Apr;86(2):255.
51. Campbell S, Cantrill J. Consensus methods in prescribing research. *Journal of clinical pharmacy and therapeutics.* 2001 Feb 15;26(1):5-14.
52. Iahafi A, Burge S. What should undergraduate medical students know about psoriasis? Involving patients in curriculum development: modified Delphi technique. *BMJ.* 2005 Mar 17;330(7492):633-6.
53. Ferri CP, Prince M, Brayne C, Brodaty H, Fratiglioni L, Ganguli M, et al. Global prevalence of dementia: a Delphi consensus study. *The Lancet.* 2005 Dec 17;366(9503):2112-7.
54. Downing SM. Validity: on the meaningful interpretation of assessment data. *Medical education.* 2003 Sep;37(9):830-7.
55. Downing SM, Haladyna TM. Validity threats: overcoming interference with proposed interpretations of assessment data. *Medical education.* 2004 Mar;38(3):327-33.

### Acknowledgments

We thank the medical students, resident physicians, and fellows for their assistance with this study.

### Conflict of Interest Statement & Funding

The Authors have no financial relationships or conflicts of interest to disclose.

Dr. Canton has been trained and funded under the Clinical Research Scientist Training Program Scholarship (CSTP) in 2019, and the Career Education and Enhancement for Health Care Diversity (CEED II) Scholarship/Program in 2018 (Project number: 1U01GM132133), both programs funded by the National Institute of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

### Author Contributions

Conceptualization, & Data Curation: SPC, NMD. Investigation, Methodology, Project Administration, Resources, Visualization, & Writing – Original Draft Preparation: SPC, CEF, NMD. Formal Analysis: SPC, CEF, IF. Supervision: CEF, NMD. Validation: SPC, CEF, LKN, NR, NMD. Writing – Review & Editing: SPC, CEF, IF, LKN, NR, NMD.

### Cite as

Canton SP, Foley CE, Fulcher I, Newcomb LK, Rindos N, Donnellan NM. Reliability and Discriminant Validity of a Checklist for Surgical Scrubbing, Gowning and Gloving. *Int J Med Stud.* 2022 Jan-Mar;10(1):18-24.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://open.library.queensu.ca/)





# Reliability Generalization of the Medical Student Stressor Questionnaire

Mason A. Montano,<sup>1</sup> Samuel A. Montano,<sup>2</sup> Jennifer L. Harrison,<sup>3</sup> Trisha M. Kivisalu.<sup>4</sup>

## Abstract

**Background:** Medical education is known to be stressful. Thus, medical schools have begun amending curricula to incorporate holistic wellness and stress reduction. Assessing medical student stressors is key to curricula development as well as the selection of appropriate reliable measures. This study investigated reliability reporting for studies using the Medical Student Stressor Questionnaire (MSSQ), as no study of this kind currently exists using Reliability Generalization (RG). **Methods:** A meta-analytic method, RG, was used to analyze the reliability reporting practices and reliability coefficients, in the form of Cronbach's alpha coefficient, for the MSSQ. While a total of 18 studies were initially isolated related to the MSSQ, only those studies reporting reliability based on their sample ( $n = 8$ ) were included in the final analysis. Blind coding was utilized and percent agreement among raters was excellent (95.18%). **Results:** Reliability estimates reported for the total scale fell within the excellent range (Range alpha coefficient ( $\alpha$ ) = 0.800 – 0.970; Mean alpha coefficient ( $M\alpha$ ) = 0.933, Standard Deviation alpha coefficient ( $SD\alpha$ ) = 0.050). A larger percent of males was negatively correlated to academic stressors while the number of females in studies was negatively correlated with social, drive, group activities and inter/intrapersonal aspects of medical student stressors. **Conclusions:** Outcomes provide useful suggestions, implications, and future recommendations regarding the use and application of the MSSQ. It is essential to assess medical student stress via measures which demonstrate robust reliability. Insights into sources of stress can offer important feedback to making specific changes to medical school curricula.

**Key Words:** Medical education; Medical students; Physician burnout; Reliability Generalization; Stress (Source: MeSH-NLM).

## Introduction

Wellness initiatives instituted by medical schools in the United States (US) are aimed to help address the recent research outcomes by the Association of American Medical Colleges (AAMC), which suggests medical education can taint humanism, decrease empathy, and increase rates of depression and suicidal ideation.<sup>1</sup> With approximately 82% of medical students having some degree of distress, prudent assessment of stress and follow-up is necessary to avoid the challenges of the omnipresent hierarchical system of medical training.<sup>2</sup> Unfortunately, there is a 5.7% attrition rate in medicine, with mental stressors being a significant factor.<sup>3</sup> The potential etiologies of stress placed on medical students is innumerable and multifactorial. Stress associated with medical education can have negative effects on patient care and lead to physician burnout.<sup>4</sup> Therefore, reliably assessing medical student stress can reduce this negative impact and improve later clinical experiences. Research shows that demonstrating attempts to reduce stress and subsequent

implementation of curriculum changes can improve the well-being of medical students.<sup>5</sup>

Given that first and second year medical school is physically and psychologically demanding, some programs in the United States, such as Case Western Reserve University, developed a wellness elective for their medical students who were subsequently qualitatively evaluated on their stress.<sup>1</sup> This wellness elective, presented by physician mentors in a one-hour lecture format over six weeks, focused on topics related to health and wellness outlining the stressors in medical practice and the importance of self-care. Results demonstrated that medical students struggled to prioritize their own well-being with the stress of medical school. The authors proposed that future studies should explore medical students' perceptions of stress in an effort to promote future wellness. Based on these findings, it is clearly important to assess medical student stress in a reliable and quantitative way to localize and implement stress reduction interventions that can be maintained longitudinally.<sup>1</sup>

<sup>1</sup> Bachelor of Science in Nursing (BSN), Medical Student Year 4 (MS4), University of Nevada at Las Vegas, School of Medicine, Las Vegas, NV, United States.

<sup>2</sup> Doctor of Philosophy in Clinical Psychology (Ph.D.), Fresno City College, Fresno, CA, United States.

<sup>3</sup> Doctor of Philosophy in Clinical Psychology (Ph.D.), Licensed Psychologist (LP), Minnesota Department of Human Services, Direct Care and Treatment - Forensic Services, St. Peter, MN, United States.

<sup>4</sup> Doctor of Philosophy in Clinical Psychology (Ph.D.), Private Practice, Vancouver, B.C., Canada.

**About the Author:** Mason Montano is a medical student in his 4th and final year at the Kirk Kerkorian School of Medicine in Las Vegas, Nevada located in the United States of America. He is a member of the Alpha Omega Alpha Medical Honors Society, recipient of the Clark County Medical Society Alliance Award, and also was honorably mentioned for the Nevada Community Engagement Awards.

## Correspondence:

Mason Montano. <https://orcid.org/0000-0003-3241-6388>

Address: 2040 W Charleston Blvd 3rd Floor, Las Vegas, NV 89102, United States

Email: [montanom91@gmail.com](mailto:montanom91@gmail.com)

Editor: Francisco J. Bonilla-Escobar

Student Editors: Joseph Tonge &

Hang-Long (Ron) Li

Copyeditor: Marina Shatskikh

Layout Editor: Sushil Dahal

Submission: Aug 5, 2021

Revisions: Aug 29, Nov 3, Nov 14, 2021

Responses: Sep 27, Nov 11, Dec 2, 2021

Acceptance: Dec 3, 2021

Publication: Dec 6, 2021

Process: Peer-reviewed

Medical education is complex and involves both broad and specific knowledge, and to date, there are only four measures designed to specifically assess medical student stress. Current tools to evaluate student stress in medical school include the Medical Student Stress Profile (MSSP<sup>6</sup>), Medical School Stressor Questionnaire (MSSQ<sup>7</sup>), the Korean version of the Higher Education Stress Inventory (K-HESI<sup>8</sup>), and the Medical Education Hassles Scale-R (MEHS-R<sup>9</sup>). Selection and use of reliable measures can provide meaningful feedback to programs about medical student stress. Although these tools are available, there is a paucity of evidence showing that these four measures can be used reliably. Moreover, to date, no meta-analysis has yet been conducted examining the MSSQ.

### Medical Student Stressor Questionnaire

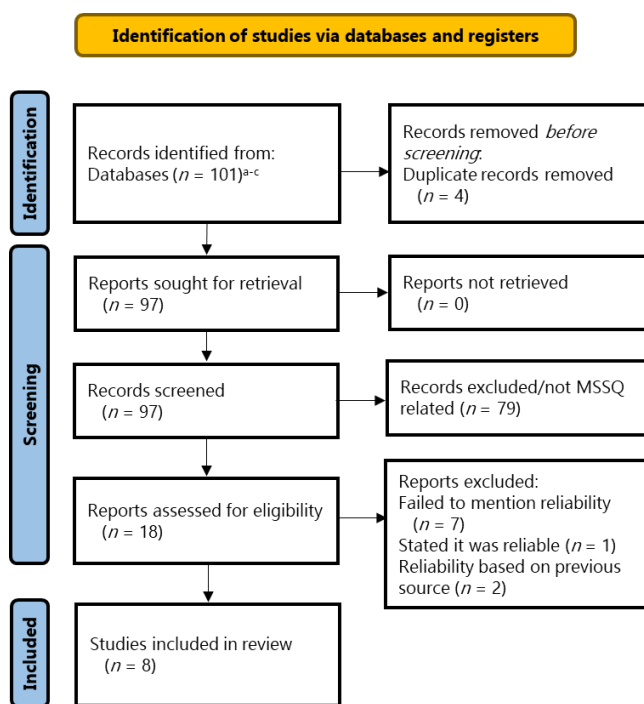
The Medical Student Stressor Questionnaire (MSSQ) was selected for analysis as it is a measure aimed directly to evaluate stressors associated with medical school. The MSSQ was initially normed in 2008-2009 on a sample of 761 medical students ranging from first to fifth year students at the School of Medical Sciences, Universiti Sains Malaysia.<sup>7</sup> The MSSQ is a self-report measure that contains 40 items that are rated on a 5-point Likert-type scale ranging from 0 "causing no stress" to 4 "causing extreme stress."<sup>8</sup> The MSSQ has a total of six *stressor groups* which include Academic Related Stressors (ARS), Interpersonal and Intrapersonal Related Stressors (IRS), Teaching and Learning Related Stressors (TLRS), Social Related Stressors (SRS), Drive and Desire Related Stressors (DRS), and Group Activities Related Stressors (GARS). The MSSQ does not appear to yield an overall score of stress, but rather evaluates stress in the context of each stressor group. Stressor scores are ranged from 0 to 4, where 0 - 1.00 = "cause mild stress," 1.01 - 2.00 = "cause moderate stress," 2.01 - 3.00 = "cause high stress," and 3.01 - 4.00 = "cause severe stress".<sup>7</sup>

The psychometrics of the MSSQ have been assessed among diverse medical students over the past 10 years. The initial alpha coefficients established by Yusoff et al.<sup>7</sup> was 0.952 for the total MSSQ; 0.921 for ARS; 0.895 for IRS; 0.858 for TLRS; 0.710 for SRS; 0.646 for DRS; and 0.728 for GARS. The MSSQ has also been validated in the Netherlands, India, Nepal, Romania, and Sri Lanka.<sup>10</sup> In the above cited studies (excluding the studies from Nepal and Netherlands which did not report reliability), reliability estimates for the total MSSQ ranged from 0.80 to 0.95; while subscale reliability estimates have ranged from less than 0.50 to 0.90.<sup>10-12</sup> Furthermore, the MSSQ has been utilized in other countries such as Italy, Bangladesh, and Ethiopia.<sup>13-15</sup>

### The Current Study

The MSSQ was developed to help assess medical student stress. Medical students are diverse in age, sex, socioeconomic status, race/ethnicity, among many other demographic characteristics. These demographic characteristics, also known as sample characteristics, impact reliability and therefore utility of a measure like the MSSQ. Reliability is heavily influenced by the characteristics

Figure 1. PRISMA diagram of RG for MSSQ.



**Legend:** a. Search terms used were "Medical Student Stressor Questionnaire" or "MSSQ"; b. Timeframe delimiter was 2009 – 2018; c. Only articles available in English were included in the analysis

of the individuals completing a measure; thus, it is essential for researchers to accurately report reliability coefficients for their study samples.<sup>16-18</sup> Currently, there exists a gap in the research for the MSSQ in that there is no study outlining the overall reliability of the measure and the sources of variance. Unfortunately, this critical step is often overlooked as many researchers erroneously induct reliability. Reliability induction is the process of inferring reliability of scores from previous studies.<sup>19</sup> We commonly see researchers stating that a measure is "reliable" or they may cite the initial reliability coefficients found for the measure. This creates an inadequate gauge of a measure's actual reliability, knowing that reliability is unique for each and every sample evaluated. This is problematic as reliability is not a product of a measure, but rather dependent on the individuals examined in a given sample. It is also concerning as it develops poor reliability reporting and limits the widespread utilization of a measure, like the MSSQ. Reliability Generalization (RG) is a form of meta-analysis used to explore reliability coefficients and analyze potential sources of variance among samples for assessment measures. The primary aim of this meta-analysis is to provide a current summary of reliability estimates, highlight patterns within the sample characteristics that may influence reliability, and speak to reliability reporting patterns of the MSSQ gathered from primary research.

## Methods

A meta-analytic method, known as Reliability Generalization (RG), was conducted with studies using the MSSQ in order to (a) investigate the reliability reporting practices in published studies for this measure, (b) determine the average internal consistency of the measure, and (c) determine its variability when administered to various populations. The RG method was initially developed by Tammy Vacha-Haase<sup>16</sup> and is a form of meta-analysis "used to explore reliability estimates and characterize the sources of this variance."<sup>16(p562)</sup> RG studies provide integral information about the calculated reliability coefficients as they may be affected by study sample and measurement characteristics. Typically, reliability coefficients estimate the percentage of variance in a set of observed scores. Cronbach's<sup>18</sup> alpha coefficient is the most common statistic of reliability and internal consistency. Researchers may use other types of reliability estimates, however, for the current study we focused on Cronbach's<sup>18</sup> alpha coefficient as it is the most broadly utilized reliability estimate.

**Table 1.** Comprehensive List of All Databases Used in the Meta-Analysis.

| Academic Search Premier              | ERIC (Education Resources Information Center)       |
|--------------------------------------|---|
| AHFS Consumer Medication Information | GreenFILE   |
| Alt Health Watch                     | Health Source: Consumer Edition                     |
| APA PsycArticles                     | Health Source: Nursing/Academic Edition             |
| APA PsycBooks                        | Library, Information Science & Technology Abstracts |
| APA PsycExtra                        | MAS Reference eBook Collection                      |
| APA PsycInfo                         | MEDLINE with Full Text                              |
| APA PsycTests                        | Military & Government Collection                    |
| Business Source Complete             | Newspaper Source                                    |
| eBook Collection (EBSCOhost)         | Regional Business News                              |
| Education Research Complete          | SocINDEX with Full Text                             |

An extensive literature search using the terms "Medical Student Stressor Questionnaire" or "MSSQ" of the EBSCOhost database was conducted, encompassing a total of 22 electronic databases (e.g., PsycINFO, MEDLINE with Full Text; for details, see **Table 1**). In addition, the research timeframe was for articles published in 2009 through to 2018. Only articles available in English were included in the study. An initial total of 101 articles were reviewed, and of these, 18 were directly related to the MSSQ and were included in this RG (see **Figure 1**). These 18 articles were assessed by an initial coder and then sorted into one of four categories: (a) articles that used the MSSQ but failed to mention reliability in any form, (b) studies that indicated the instrument was reliable and/or no mention of reliability from the authors' data or from a previous source that used the MSSQ, (c) articles that only presented reliability coefficients from previous studies, and (d) studies that

reported reliability based upon their current study data. Only articles within the final category were included in the analysis for the purposes of this RG.

A coding sheet was developed to gather uniform data across the articles to be analyzed. These articles were initially coded by one researcher and then blind-coded by another researcher to confirm accuracy. Discrepancies were investigated and resolved among coders, as the overall percent agreement among coders was 95.18%, demonstrating excellent interrater reliability. Continuous variables coded included publication year, total reliability score, subscale reliability scores, sample size, and year of study (in medical or graduate program). Additional sample characteristics, including gender and race/ethnicity were categorically coded. After differences from interrater reliability discrepancies were resolved, data was entered into Microsoft Excel and then exported to Statistical Package for Social Sciences (SPSS) for statistical analyses.

Reliability reporting patterns for each study included in the analysis were numerically calculated through sums and percentages as is one of the main aims in RG analysis. Additionally, mean alpha coefficients ( $M\alpha$ ) for each subscale were calculated. While there are a number of ways to interpret Cronbach's<sup>18</sup> alpha coefficients, it is more commonly interpreted via the guidelines established by George and Mallery<sup>20</sup> where "> 0.9 – Excellent, > 0.8 – Good, > 0.7 – Acceptable, > 0.6 – Questionable, > 0.5 – Poor, and < 0.5 – Unacceptable".<sup>21</sup> Moreover, in order to determine if sample and measurement characteristics had any statistically significant impact on reported alpha coefficients in published studies, Pearson's  $r$  correlations were computed for continuous variables. It should be noted that variables included within the analysis depended upon the reporting practices within original studies, thus, the current analyses will include number of males or females and/or percents, and therefore utilize both in the analyses.

## Results

The results outlined within this section begin by examining the overall sample size and reliability reporting practices. Second, results discuss study characteristics of those included within the analysis, and present the mean alpha coefficients. Third, results based on correlations conducted for subscales, and demographic variables with alpha coefficients are presented. Finally, variables that could not be assessed are outlined.

Data collected for this study represented a total sample of 2,542 participants. In order to determine which of the four categories publications fell within, analysis of reliability reporting practices was conducted. Of the articles reviewed, 44% ( $n = 10$  alpha coefficients; 8 studies<sup>7,22-28</sup>) of the studies did report a Cronbach's<sup>18</sup> alpha reliability coefficient for their sample. One study reported a total of three alpha coefficients, whereas the remainder of studies reported one alpha coefficient. Another 11%, ( $n = 2$ ) of the studies reported reliability based on previous

sources. Additionally, 6%, ( $n = 1$ ) of studies stated, "it is reliable." Overall, 39%, ( $n = 7$ ) of studies completely failed to mention reliability at all (see Figure 1). Fifty-six percent (56%) of studies failed to report reliability coefficients for their samples. The MSSQ was used predominantly in studies within Malaysia ( $n = 9$  alpha coefficients, 90%) and one study reporting reliability was conducted with a sample from Aruba ( $n = 1$ ; 10%). None of the studies used the MSSQ in the US.

**Table 2.** MSSQ Summary Statistics for Reported Cronbach's Alpha Coefficients.

| Scale      | $n$ | $M\alpha$ | $SD\alpha$ | Minimum $\alpha$ | Maximum $\alpha$ |
|------------|-----|-----------|------------|------------------|------------------|
| ARS        | 9   | 0.886     | 0.047      | 0.810            | 0.940            |
| IRS        | 9   | 0.907     | 0.050      | 0.780            | 0.950            |
| TLRS       | 9   | 0.827     | 0.088      | 0.610            | 0.900            |
| SRS        | 9   | 0.688     | 0.185      | 0.200            | 0.800            |
| DRS        | 9   | 0.690     | 0.108      | 0.420            | 0.777            |
| GARS       | 9   | 0.790     | 0.105      | 0.550            | 0.911            |
| MSSQ total | 10  | 0.933     | 0.050      | 0.800            | 0.970            |

**Legend:** ARS = Academic Related Stressors, IRS = Interpersonal and Intrapersonal Related Stressors, TLRS = Teaching and Learning Related Stressors, DRS = Drive and Desire Related Stressors, GARS = Group Activities Related Stressors, MSSQ = Medical Student Stressor Questionnaire,  $n$  = number,  $M\alpha$  = Mean alpha coefficients,  $SD$  = Standard Deviation.

A total of eight studies, providing 10 alpha coefficients, were included for analysis. All the publications reporting alpha coefficients for their study sample were peer-reviewed journal articles published between 2009 and 2018. Total reliability scores for the MSSQ ranged from 0.800 to 0.970 with a mean of 0.933 ( $SD = 0.050$ ), falling within the excellent range ( $> 0.90$ ). There was variability in reliability coefficients for subscales of the MSSQ where subscales yielded low alpha coefficients ( $< 0.70$ ) based on study samples suggesting caution for use and interpretation of scale outcomes (see **Table 2**). One subscale, Interpersonal and Intrapersonal Related Stressors (IRS), reported alpha coefficients that fell within the excellent range of values ( $M\alpha = 0.907$ ). Two subscales fell within the good range, including Academic Related Stressors (ARS,  $M\alpha = 0.886$ ) and the Teaching and Learning Related Stressors (TLRS,  $M\alpha = 0.827$ ). One subscale fell within the acceptable range, Group Activities Related Stressors (GARS,  $M\alpha = 0.790$ ). There were two subscales whose reported mean reliability estimates fell just below acceptable values, Social Related Stressors (SRS,  $M\alpha = 0.688$ ) and Drive and Desire Related Stressors (DRS,  $M\alpha = 0.690$ ).

Most studies reported administering the MSSQ one time ( $n = 7$ , 87.5%) while one noted multiple administrations of the measure ( $n = 1$ , 12.5%). Analyses found a positive correlation between reported reliability coefficients and the number of males in the sample ( $r = 0.982$ ,  $p = 0.018$ ) suggesting that the items within the MSSQ may be more readily endorsed by males completing the measure. Percent of males within a study sample was negatively correlated with reported ARS subscale reliability coefficients ( $r =$

$- 0.943$ ;  $p = 0.016$ ). Conversely, the number of females within studies was negatively correlated with the reliability estimates reported for the MSSQ subscales including IRS ( $r = - 0.822$ ,  $p = 0.023$ ), SRS ( $r = - 0.759$ ,  $p = 0.048$ ), DRS ( $r = - 0.957$ ,  $p = 0.001$ ), and GARS ( $r = - 0.781$ ,  $p = 0.038$ ).

**Table 3.** Supplementary Variables and Reported Cronbach's Alpha Coefficients.

| Variables                      | $n$ | $M\alpha$ |
|--------------------------------|-----|-----------|
| Publication Year               |     |           |
| 2009                           | 1   | 0.950     |
| 2010                           | 1   | 0.952     |
| 2011                           | 2   | 0.933     |
| 2013                           | 2   | 0.960     |
| 2014                           | 1   | 0.915     |
| 2015                           | 1   | 0.800     |
| Race/Ethnicity                 |     |           |
| > 60% Asian                    | 4   | 0.951     |
| Other                          | 1   | 0.915     |
| Unknown                        | 3   | 0.901     |
| Year of Study (Medical School) |     |           |
| First Year                     | 1   | 0.963     |
| Varied Years                   | 4   | 0.904     |
| Unknown                        | 3   | 0.940     |

**Legend:**  $n$  = Number of studies,  $M\alpha$  = Mean alpha coefficient,  $>$  = greater than.

Publication year, race/ethnicity, and year of study did not demonstrate any impact on reported reliability estimates in the published studies reviewed due to lack of variability in data collected (see **Table 3**). Some sample and measurement variables were not able to be assessed due to lack of reporting which included age of study participants, gender diversity (other than male or female), marital status, religion, income, sampling procedure, total scale mean, and total scale standard deviation.

## Discussion

The MSSQ was initially validated and subsequently utilized in Southeast Asian communities as a way to assess sources of stress for medical students. Medical students worldwide experience stress in their coursework and clinical training. Consequently, utilizing an instrument that demonstrates high internal consistency estimates with diverse samples is paramount. The goals of the present RG analysis were to assess the reliability reporting practices and internal consistency estimates for the studies employing the MSSQ. The current RG found that total reliability estimates for the MSSQ were consistent with the initial alpha coefficients established by Yusoff et al.<sup>7</sup>

Reliability estimates for the subscales of the MSSQ demonstrated variability and ranged from just below acceptable ( $< 0.70$ ) to excellent ( $> 0.90$ ). In general, among the totality of published literature that was initially examined for inclusion within this RG meta-analysis, overall reliability reporting patterns using the MSSQ showed underreporting of reliability coefficients. Many of

the studies did not report reliability coefficients based on their own samples and some neglected to include anything about reliability of the instrument. More specifically, only 44% of the articles that were reviewed reported an alpha coefficient directly calculated from their sample, which limits generalizability of the current results and consequently should be interpreted cautiously. These results are similar to past reliability generalization studies, which indicate very small percentages of studies reviewed had reported reliability data for their samples.<sup>16</sup>

MSSQ total reliability score analysis found a significant positive correlation between percent of males and total MSSQ reliability. While small in sample size, overall, these outcomes indicate that items on the MSSQ may resonate more consistently with men's experience of medical stressors. Additional subscale analyses found significant negative correlations between percent of males in the study and reported ARS reliability coefficients. Therefore, items on the ARS subscale were less consistent with men. Items on the ARS relate to tests, heavy workload, falling behind, receiving poor marks, needing to do well, and difficulty answering questions from teachers and ultimately, were not consistently reflective of men's stress factors related to medical education. Related to these outcomes, recent research in medical education pertaining to gender specific perception and attitudes toward the burdens of everyday student life indicated that more male students were convinced they were superior to the other sex in handling academic performance pressure.<sup>29</sup> Therefore, this tendency among males may help contextualize inconsistent responding to items on this subscale because males may be less likely to reliably endorse issues with academic performance. In addition, four subscale analyses revealed a significant negative relationship between reported reliability estimates and the number of females within the studies.

Outcomes of this study suggest that there are gender differences for some MSSQ subscales. Women's experiences in medical school were not consistently reflected by items on the IRS subscale which relate to conflict with others or poor motivation to learn, nor items on the SRS subscale which are associated with stress in conveying medical information to patients or answering patient questions. Further, the DRS subscale (family responsibility, unwillingness to study medicine, and a parental desire to study medicine) were not consistently reflective of women's drive to pursue medical education. Finally, the GARS subscale assesses perceived pressure to do well by others or feelings of incompetence and was not reliably reflective of stressors experienced by women in medical education. It is possible that like men, women are driven to pursue medical education by a desire to be a helping professional and reduce inequities in health systems which are not currently reflected as items on the MSSQ. Consequently, items on these subscales need further revision to better assess and reflect stressors consistently experienced by women in medical school. Given that these results are preliminary and from a small sample size, they should be interpreted with caution and assessed in further research to determine if such

correlational relationships exist in larger samples among other nations and cultures worldwide.

### Limitations

One of the largest limitations of this reliability generalization meta-analysis was the lack of reliability estimates reported within published studies utilizing the MSSQ. Over half of the studies reviewed did not report reliability; they either inferred or inducted reliability or made no mention of reliability at all. The RG method relies on available literature to report reliability estimates for their sample and provide details related to study and measurement characteristics. Therefore, studies that lack such information for their sample cannot be utilized. Consequently, this is a limitation to the current data presented within this study, implicating that these results have limited generalizability, and thus, the results should be interpreted with caution. Reliability reporting standards are not currently being upheld. Second, as a consequence of limited reliability reporting, detailed analyses for sample and measurement characteristics (i.e., age, marital status, income, projected specialization, and language spoken) could not be conducted and need to be further analyzed in larger studies. Third, while the MSSQ has been translated into English, no studies have yet been conducted in North American samples. Expanding utilization of the MSSQ geographically could improve the instrument's overall generalizability internationally. In addition, a significant limitation to this RG study is the restricted sample size as this limits interpretability of the analyses and outcomes presented. The additional subscale analyses conducted with percent of males and number of females infers a possible presence of sex bias, though yielded in even smaller sample sizes and should be cautiously interpreted.

### Future Directions

Future research for the MSSQ should focus on utilizing the instrument with diverse international samples, including the US. As medical schools continue to put more attention to assessing and reducing medical students' experiences of stress, the formal use of the MSSQ in medical schools may help to identify specific sources of stress and targeted interventions. It is incumbent upon medical school programs to raise their awareness and knowledge of adequate measures to reliably assess medical student stress as a means to make medical education experiences more manageable. While overall the MSSQ as applied to Asian cultures produces good to excellent reliability estimates predominantly for men, there is some caution for use of interpreting the subscales with female medical students. Additional research is warranted due to the small sample size within this study.

In addition, researchers are encouraged to include detailed descriptors of diversity in their sample, such as age, gender, sexual orientation, income, socioeconomic status, year of medical school, marital status, and previous education to better quantify participants' data. Inherent in medical school is the experience of stress, although sources of stress may vary by individual. Further research is needed to assess and quantify stressors present

among medical students. Outcomes from measures, such as the MSSQ, can greatly inform medical schools to further develop practices or supplementary resources to reduce the potential negative effects of medical student stress. Researchers who intend to use the MSSQ are strongly encouraged to calculate and report reliability estimates for their samples to contribute to the growing body of knowledge of the utilization of this measure.

### Conclusions

Overall, reliability estimates reported for studies included in this RG analysis were similar to those initially established by Yusoff et al.<sup>7</sup> for the MSSQ. Total score reliability for the MSSQ falls within the excellent range while subscales showed some variability. Unfortunately, many studies did not report reliability, limiting the

number of studies that could be included in this analysis. This is similar to previous RG study findings and indicates reliability reporting practices remain low in published literature. Reliability needs to be assessed as it is an integral first step towards inferring measurement validity. As such, researchers are encouraged to report the reliability estimates for their study samples to uphold reliability reporting standards. Assessing medical student stress reliably and accurately is essential to designing interventions and reducing the potential resultant negative impacts that are currently present within the medical education system. It is imperative that more researchers use the MSSQ and report their sample's reliability estimates before the MSSQ can be more widely adopted.

### References

- Lee J, Graham AV. Students' perception of medical school stress and their evaluation of a wellness elective. *Med Educ*. 2001 Jul;35(7):652-659.
- Dyrbye LN, Harper W, Durning SJ, Moutier C, Thomas MR, Massie FS, et al. Patterns of distress in US medical students. *Med Teach*. 2011 Oct 1;33(10):834-839.
- Maher BM, Hynes H, Sweeney C, Khashan AS, O'Rourke M, Doran K, et al. Medical school attrition-beyond the statistics a ten year retrospective study. *BMC Med Educ*. 2013 Jan 31;13:13.
- Noori S, Blood A, Meleca J, Kennedy V, Sengupta D. Current directions in medical student well-being. *Col Med Rev*. 2017 Mar 6;(2):10-19.
- Strayhorn G. Effect of a major curriculum revision on students' perceptions of well-being. *Acad Med*. 1989 Jan;64(1):25-29.
- O'Rourke M, Hammond S, O'Flynn S, Boylan G. The Medical Student Stress Profile: a tool for stress audit in medical training. *Med Educ*. 2010 Apr 8;44(10):1027-1037.
- Yusoff MSB, Rahim AFA, Yaacob MJ. The development and validation of the Medical Student Stressor Questionnaire (MSSQ). *ASEAN J Psychiat*. 2010 Jun 1;11(1):13-24.
- Shim EJ, Jeon HJ, Kim H, Lee KM, Jung D, Noh HL, et al. Measuring stress in medical education: validation of the Korean version of the higher education stress inventory with medical students. *BMC Med Educ*. 2016 Nov 24;16(1):302-310.
- Johnson JC, Degenhardt BF, Smith CK, Wolf TM, Peterson DF. Tool for predicting medical student burnout from sustained stress levels: Factor analysis of the Medical Education Hassles Scale-R. *J Am Osteopath Assoc*. 2018 Mar 1;118(3):170-180.
- Jayarajah U, Lakmal K, Athapathu A, Jayawardena AJ, de Silva V. Validating the Medical Students' Stressor Questionnaire (MSSQ) from a Sri Lankan medical faculty. *J Taibah Univ Med Sci*. 2020 Aug 29;15(5):344-350.
- Bob MH, Popescu CA, Pirlog R, Buzoianu AD. Personality factors associated with academic stress in first year medical students. *HVM Bioflux*. 2014 Apr 23;6(1):40-44.
- Gupta S, Choudhury S, Das M, Mondol A, Pradhan R. Factors causing stress among students of a medical college in Kolkata, India. *Educ Health*. 2015 Jul 31;28(1):92-95.
- Dagani J, Buizza C, Ferrari C, Ghilardi A. Psychometric validation and cultural adaptation of the Italian medical student stressor questionnaire. *Curr Psychol*. 2020 July 15.
- Eva EO, Islam MZ, Mosaddek AS, Rahman MF, Rozario RJ, Iftekhar AF, et al. Prevalence of stress among medical students: A comparative study between public and private medical schools in Bangladesh. *BMC Res Notes*. 2015 Jul 30;8:327-334.
- Melaku L, Mossie A, Negash A. Stress among medical students and its association with substance use and academic performance. *J Biomed Educ*. 2015 Dec 2;2015(4):1-9.
- Vacha-Haase T. Reliability generalization: Exploring variance in measurement error affecting score reliability across studies. *Educ Psychol Meas*. 1998 Feb 1;58(1):6-20.
- Wilkinson L. Statistical methods in psychology journals: Guidelines and explanations. *Am Psychol*. 1999 Aug 1;54(8):594-604.
- Cronbach LJ. Coefficient alpha and the internal structure of tests. *Psychometrika*. 1951 Sep;16:297-334.
- Vacha-Haase T, Henson R, Caruso J. Reliability generalization: Moving toward improved understanding and use of score reliability. *EPM*. 2002 Aug 1;62(4):562-569.
- George D, Mallery P. *SPSS for Windows step by step: A simple guide and reference*. 11.0 update (4th ed.). Boston: Allyn & Bacon; 2003.
- Nunnally JC. *Psychometric theory*. New York: McGraw-Hill; 1978.
- Yusoff MSB. A multicenter study on validity of the Medical Student Stressor Questionnaire (MSSQ). *Intl Med J*. 2011 Mar 1;18:14-18.
- Yusoff MSB. The stability of MSSQ to measure stressors among medical students. *Intl Med J*. 2013 Apr 21;20(2):250-252.
- Yusoff MSB, Fuad AFA, Yaacob, MJ. Prevalence and sources of stress among Universiti Sains Malaysia medical students. *The Malaysian J of Med Sci: MJMS*. 2010 Jan 1;17(1):30-37.
- Gupta S, Choudhury S, Das M, Mondol A, Pradhan R. Factors causing stress among students of a medical college in Kolkata, India. *Educ Health (Abingdon)*. 2015 Aug 11;28(1):92-95.
- Othman CJ, Farooqui M, Yusoff MSB, Adawiyah R. Nature of stress among health science students in a Malaysian university. *AicEBs London (Asia Pacific International Conference on Environment Beh Studies)*. 2013 Dec 1;105(3):249-257.
- Ravi SP, Balasubramaniam R, Ramireddy R, Diamante P, Barton B, Dwivedi N. Stress and coping strategies among premedical and undergraduate basic science medical students in a Caribbean medical school. *Ed in Med J*. 2014 Dec 1;6(4):48-56.
- Yusoff MSB. A confirmatory factor analysis study on the Medical Student Stressor Questionnaire among Malaysian medical students. *Ed in Med J*. 2011 Jun 1;3(1):44-53.
- Steiner-Hofbauer V, Capan M, Holzinger A. Focus gender - medical students' gender-specific perception and attitudes towards the burdens of everyday student life. *GMS J Med Educ*. 2020 Mar 16;37(2):Doc15.

---

**Acknowledgments**

None.

**Conflict of Interest Statement & Funding**

The Authors have no funding, financial relationships or conflicts of interest to disclose.

The third author delineates that this article and included views and research findings are the author's own and are in no way affiliated with Minnesota Department of Human Services, Direct Care and Treatment – Forensic Services.

**Author Contributions**

Conceptualization, Data Curation, Investigation, Methodology, Project Administration, Resources, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review and Editing: MAA, SAM, JLH, TMK; Formal Analysis, Software: JLH, TMK; Supervision: JLH, TMK.

**Cite as**

Montano, MA, Montano, SA, Harrison, JL, Kivisalu, TM. Reliability Generalization of the Medical Student Stressor Questionnaire. Int J Med Stud. 2022 Jan-Mar;10(1):25-31.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](#)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](#)



# Teachers' View on Online Classes during the COVID-19 Lockdown – A Cross-Sectional Study

Andrew Thomas,<sup>1</sup> Mohan T. Shenoy,<sup>2</sup> Kotacherry T. Shenoy,<sup>3</sup> Sruthi Suresh Kumar,<sup>1</sup> Aboobakker Sidheeque,<sup>1</sup> C. Khovidh,<sup>4</sup> Jayakumar Parameshwaran Pillai,<sup>5</sup> Pramod Murukan Pillai,<sup>6</sup> Shana Sherin CH,<sup>7</sup> Anna Mathew,<sup>8</sup> Twinkle Zakkir,<sup>9</sup> Sreelakshmi Dileep,<sup>10</sup> Victory Mekha,<sup>11</sup> Sony Raju,<sup>12</sup> Mohammed Junaid K,<sup>13</sup> Sivendu P.<sup>14</sup>

## Abstract

**Background:** Online classes have resumed in many colleges amidst the COVID-19 lockdown. Our study aimed to evaluate the opinions of medical teachers who conducted online classes and determine their views on the viability of these classes in a post-COVID-19 era. **Methods:** We carried out a cross-sectional study using an online survey. Teachers working in medical colleges who conducted online classes during the COVID-19 lockdown were included. Questionnaires were shared in WhatsApp groups of the medical teachers belonging to the states of Kerala and Tamil Nadu, India. Sampling was consecutive and convenient. **Results:** Respondents were 101 teachers, among which 89 were included in the analysis. The majority of the teachers gave classes after intense preparation. The participants felt that the quality of their work would have been better with enhanced Information Technology (IT) infrastructure. One of the major reasons for favoring online classes was the opportunity it gave them to access the content later (56.2%, n=50). More than half (63%, n=56) of the teachers faced network issues and felt discouraged by the lack of interaction. Thirty-six percent (n=32) of the teachers opined that online classes were very poor compared with regular classes. However, 49.4% (n=44) favored the continuation of online classes after the COVID-19 lockdown. **Conclusion:** Despite experiencing problems, most participants wanted to continue online classes in the future. The participants felt that the classes were less interactive and educational institutions should improve their IT infrastructure to address the increasing need for online education.

**Key Words:** Medical faculty; Online education; Attitudes; COVID-19 pandemic (Source: MeSH-NLM).

## Introduction

On 31 December 2019, the World Health Organization (WHO) was notified about several cases of pneumonia with unknown etiology in Wuhan city of Hubei province, China.<sup>1</sup> This was found to be caused by a single-stranded RNA virus of the Coronaviridae family. As this infection spread to other countries, the WHO declared a public health emergency and subsequently declared this outbreak a pandemic. Most countries worldwide closed their universities and colleges as part of lockdown in a bid to contain the spread of this infection, which impacted almost 70% of the world's student population.<sup>3</sup> As a result, the COVID-19 pandemic necessitated migration from regular to online classes in many countries.

Peter H. Martorella described technology in education as a "sleeping

giant" over two decades ago.<sup>4</sup> However, low and middle-income countries like India have inadequate internet coverage and network infrastructure, which seriously affect the quality of online classes. Also, replicating pedagogic teaching is difficult in online education. One way of improving the efficiency of online classes is to promote interactive activities and conversations using virtual discussion groups on social media.<sup>5</sup>

A student-centered approach in education, with embedded opinions from teachers, is vital to sustaining the quality of education. Unfortunately, the opinions of teachers are often overlooked. Motivating the teaching staff to give online classes seriously and improving IT infrastructure is necessary for the success of online education.<sup>6</sup> IT infrastructure refers to hardware, software and network tools that support the delivery of certain

<sup>1</sup> Medical student, Sree Gokulam Medical College and Research Foundation, Trivandrum, India.

<sup>2</sup> MBBS, MD, DM Department of Endocrinology, Sree Gokulam Medical College and Research Foundation, Trivandrum, India.

<sup>3</sup> MBBS, MD, DM, FRCP Head of Department of Gastroenterology, Head of Institutional Research Cell (IRC), Sree Gokulam Medical College and Research Foundation, Trivandrum, India.

<sup>4</sup> Medical student, SRM Medical College Hospital and Research Centre, Chennai, India.

<sup>5</sup> MSc Department of Biochemistry, Government Medical College, Trivandrum, India.

<sup>6</sup> Medical student, Sree Narayana Institute of Medical Sciences, Ernakulam, India.

<sup>7</sup> Medical student, Believers' Church Medical College, Thiruvalla, India.

<sup>8</sup> Medical student, Pushpagiri Medical College, Thiruvalla, India.

<sup>9</sup> Medical student, Travancore Medical College, Kollam, India.

<sup>10</sup> Medical student, Government Medical College, Kannur, India.

<sup>11</sup> Medical student, Malabar Medical College Hospital and Research Centre, Calicut, India.

<sup>12</sup> Medical student, Government Medical College, Thrissur, India.

<sup>13</sup> Medical student, Al Azhar Medical College & Super Specialty Hospital, Idukki, India.

<sup>14</sup> Medical student, KMCT Medical College Hospital, Calicut, India.

**About the Author:** Andrew Thomas is currently a final year medical student of Sree Gokulam Medical College and Research Foundation, Trivandrum, India. He is a student reviewer for International Journal of Medical Students and Student British Medical Journal. He is also a recipient of Short-Term Studentship 2019 by ICMR (Indian Council of Medical Research), Best paper award at NATCON 2019, Government medical college, Trivandrum.

## Correspondence:

Andrew Thomas. <https://orcid.org/0000-0002-2997-4525>

Address: Aalamthara - Bhoothamadakki Rd, Venjaramoodu, Kerala 695607, India

Email: [drandrewthomasji@gmail.com](mailto:drandrewthomasji@gmail.com)

Editor: Francisco J. Bonilla-Escobar  
Student Editors: Azher Syed, Mohamed Fahmy Doheim, Purva Shah  
Copyeditor: Sohaib Haseeb  
Proofreader: Sebastian Diebel  
Layout Editor: Annora Kumar

Submission: Oct 10, 2020  
Revisions: Dec 17, 2020, Apr 17, Nov 3, 2021  
Responses: Feb 1, 2020, Sep 17, Nov 9, 2021  
Acceptance: Nov 14, 2021  
Publication: Dec 6, 2021  
Process: Peer-reviewed



services (e.g., online classes). The use of technology is no longer unusual among teachers. They use social media platforms, converse in WhatsApp and have basic knowledge regarding video editing and sharing.

Knowledge-sharing through social media networks, along with enrolment in web-based courses, will help increase interest and maximize participation in virtual teaching.<sup>7,8</sup> The net result will be that teachers will be motivated to improve the quality of their online classes. As medical colleges have been actively involved in online teaching for more than a month now, we designed a study to capture the opinions of medical teachers who have conducted online classes and assess their views on whether to continue these classes post COVID-19 lockdown in India.

## Methods

A cross-sectional survey was conducted from May 2020 to June 2020 during the COVID-19 lockdown. The survey questionnaire was distributed among medical teachers currently working in medical colleges in the states of Kerala and Tamil Nadu, India. These states were selected because they were the first to start online classes during the COVID-19 lockdown. Teachers who conducted at least one virtual class gave assignments or uploaded videos on social media platforms were included in the study. The sampling was consecutive and convenient.

The questionnaire was self-administered in English using Google Forms (Google LLC, CA, U.S.A). WhatsApp (WhatsApp Inc, CA, U.S.A) was used to distribute the survey links. The authors met with the Head of the departments (HOD) and used help from their fellow medical students to collect the mobile phone numbers of the medical teachers who were taking online classes. The links were shared in the WhatsApp groups used by the teachers. Furthermore, the respondents were encouraged to share the links to the questionnaire with their colleagues. The questionnaire was online for one week (03 to 10 May 2020). The participants were informed about the aims, benefits and implications of the study, and their consent was sought before beginning the survey. We included all eligible respondents who responded to the survey questionnaire. Restricting the number of responses from a single e-mail id was put to ensure there was no double entry. Participants who did not complete the survey questionnaire in its entirety and respondents who were not medical teachers were excluded. The study was conducted after getting approval from the Institutional Research Cell (IRC) of Sree Gokulam Medical College and Research Foundation, Trivandrum, India (SGMC/ IRC No:283/ 05/ 2020).

Sampling bias was addressed by including all the respondents who satisfied the inclusion criteria and who had completed the questionnaire in its entirety. There was no recall bias since we included respondents who were currently involved in giving online classes. The recall period was two months. There was no grouping and the variables analyzed were qualitative except the age of the respondents.

## Questionnaire

The participants were asked to fill out a semi-qualitative questionnaire comprising 26 questions. The questionnaire was pilot tested and face validated among ten teachers.

The questionnaire had four sections. The first section sought information on the age, gender, and area of specialization of the participant, the type of institution (government or private) they are affiliated to, and the pin code of the institution. The second asked for details about the participants' previous experiences in online education and training. This included questions on the characteristics of the online classes that were conducted over the last two weeks (from 18 April to 02 May 2020), specifically about the duration of online classes, the time taken for preparation, the devices, platforms and type of accounts used, the place where they conducted their classes. The IT department referred to rooms made available for teachers for conducting online classes. The third section demanded that the participants rate their online classes. The Likert responses were organized under five categories: very poor, poor, average, good, and excellent. These were used to determine the quality of audio, video/ image/slide quality, the content, the extent of interaction, and the opportunities given to students for clearing doubts at the end. Questions were also asked about how online classes compared with regular classes, and this was done on the scale of five (with 'one' favoring regular and 'five' favoring online classes). The fourth section was on what they liked or disliked about online classes and sought suggestions to improve online classes. Finally, they were asked whether they wished online classes to continue after the COVID-19 lockdown. The participants were encouraged to select multiple answers for questions regarding experience, likes and dislikes, devices, platforms, practice and suggestions for online classes.

## Data Analysis

Specialties were classified into clinical (Ophthalmology, Otolaryngology, Medicine, Surgery, Obstetrics and Gynecology (OBGYN), Pediatrics, Orthopedics, and Radiology) and para/non-clinical groups (Anatomy, Biochemistry, Physiology, Pharmacology, Microbiology, Pathology, Forensic medicine and Community medicine).

The data was exported from Google forms to Microsoft Excel (Microsoft Corp, WA, U.S.A). Descriptive statistics were used for data presentation because there was no prior hypothesis.

The degree of association was calculated using the Chi-square test, and a p-value of less than 0.05 was taken as statistically significant. SPSS v25 for Windows (Statistical Package for the Social Sciences, SPSS Inc, U.S.A) was used to compare the outcomes of clinical and para/non-clinical departments.

Ethical approval for the study was granted by the Institutional Ethics Committee (IEC), Sree Gokulam Medical College and Research Foundation, Trivandrum, India.

**Table 1.** Devices and Platforms used by Medical Teachers for Online Classes.

|                                 |                        | Total (n=89)<br>n (%) | Clinical (n=36)<br>n (%) | Non-clinical (n=53)<br>n (%) | p-value |
|---------------------------------|------------------------|-----------------------|--------------------------|------------------------------|---------|
| Devices used for online classes | Smart Phones           | 50 (56.2)             | 16 (44.4)                | 34 (64.2)                    | 0.066   |
|                                 | Tablets                | 12 (13.5)             | 8 (22.2)                 | 4 (7.5)                      | 0.047   |
|                                 | PC (Personal computer) | 80 (89.9)             | 32 (88.9)                | 48 (90.6)                    | 0.797   |
| Platforms used                  | Google platforms       | 41 (46.1)             | 13 (36.1)                | 28 (52.8)                    | 0.120   |
|                                 | ZOOM                   | 52 (58.4)             | 23 (63.9)                | 29 (54.7)                    | 0.389   |
|                                 | Skype                  | 24 (27)               | 17 (47.2)                | 7 (13.2)                     | 0.000   |
|                                 | YouTube                | 23 (25.8)             | 8 (22.2)                 | 15 (28.3)                    | 0.520   |
|                                 | WhatsApp               | 47 (52.8)             | 13 (36.1)                | 34 (64.2)                    | 0.009   |
|                                 | Others                 | 12 (13.5)             | 7 (19.4)                 | 5 (9.4)                      | 0.175   |

## Results

### Respondents' Characteristics

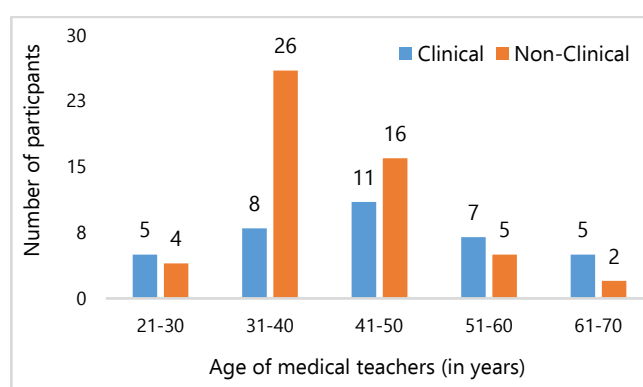
A total of 101 medical teachers responded to our survey questionnaire. We excluded 12 participants from the analysis because they did not satisfy the inclusion criteria. Out of 89 participants 65% (n=58) were females and 35% (n=31) males, most of them between 30 and 50 year of age (*Figure 1*). The private sector constituted 93.3% (n=83), whereas the government sector came to only 6.7% (n=6). 43.8% (n=39) had no idea about online classes before COVID-19 lockdown. 46.1% (n=41) had attended online classes earlier, and 18% (n=16) had the experience of conducting online classes before lockdown.

### Online Class Characteristics

*Table 1* shows the devices and platforms used for conducting online classes. Among the devices used, tablet use was significantly different between clinical and non-clinical teachers. (p= 0.47). Among the platforms used, Skype and WhatsApp use differed significantly between the clinical and non-clinical teachers (p=0.000; p=0.009). A total of 66.3% (n=59) used basic or free software, 23.6% (n=21) used premium or paid accounts, and 10.1% (n=9) of the participants did not know the details.

There was no significant association between the time taken for the preparation and duration of online classes (*Figure 2*). While 70.8% (n=63) conducted classes from the IT department of their institution, 58.4% (n=52) taught from home and 22.5% (n=20) from their personal office.

**Figure 1.** Duration of Classes and Time Taken for Preparation of Online Classes by the Medical Teachers (Clinical and Non-Clinical Teachers).



**Table 2.** Likes and Dislikes of Online Classes.

|                                   |                                      | Total (n=89)<br>n (%) | Clinical (n=36)<br>n (%) | Non-clinical (n=53)<br>n (%) | p-value |
|-----------------------------------|--------------------------------------|-----------------------|--------------------------|------------------------------|---------|
| Reasons to like online classes    | Can access contents later            | 50 (56.2)             | 19 (52.8)                | 31 (58.5)                    | 0.594   |
|                                   | More relaxed/ Flexible working hours | 26 (29.2)             | 12 (33.3)                | 14 (26.4)                    | 0.481   |
|                                   | Students are more regular/ attentive | 40 (44.9)             | 23 (63.9)                | 17 (32.1)                    | 0.003   |
|                                   | None                                 | 7 (7.9)               | 2 (5.6)                  | 5 (9.4)                      | 0.505   |
| Reasons to dislike online classes | Network problems                     | 56 (62.9)             | 26 (72.2)                | 30 (56.6)                    | 0.134   |
|                                   | Insufficient time                    | 15 (16.9)             | 3 (8.3)                  | 12 (22.6)                    | 0.077   |
|                                   | Lack of expertise                    | 37 (41.6)             | 14 (38.9)                | 23 (43.4)                    | 0.672   |
|                                   | Visual/ auditory fatigue             | 24 (27)               | 10 (27.8)                | 14 (26.4)                    | 0.887   |
|                                   | Lack of interaction                  | 56 (62.9)             | 21 (58.3)                | 35 (66)                      | 0.460   |
|                                   | Too casual                           | 43 (48.3)             | 16 (44.4)                | 27 (50.9)                    | 0.547   |
|                                   | None                                 | 8 (9)                 | 4 (11.1)                 | 4 (7.5)                      | 0.564   |

**Teachers' Opinions on Online Classes**

The reasons for liking and disliking online classes are summarized in **Table 2**. The participants were asked to give suggestions for improving online classes. The top suggestions were: improve IT infrastructure in the educational institution 59.6%, n=53, ensure good lighting in the environment [57.3% (n=51)]. A total of 57.3% (n=51) felt they would do better with training from peers, whereas 41.6% (n=37) felt having light refreshments would improve the online classes. The participants' rating of online classes as per the results of the Likert scale is summarized in **Figure 3** There were 49.4% (n=44) respondents who wanted to continue online classes after lockdown; 38.2% (n=34) were neutral whereas 12.4% (n=11) were against continuing online classes.

**Discussion**

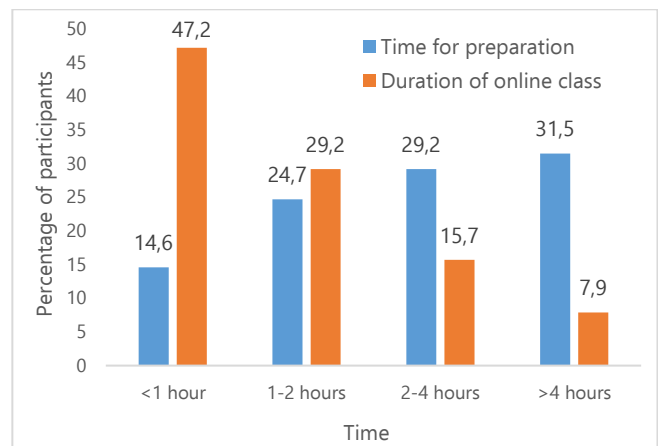
We conducted a cross-sectional survey among medical teachers who gave online classes during the COVID-19 lockdown. Most of the participants – 93.3% (n=83) – were from private medical colleges. This was expected because many government medical colleges have not started online classes during the study period. The delay in starting online classes may be due to the increasing admission of COVID-19 patients in government set-ups and the lack of basic resources for starting online classes.

More than half – 56.2% (n=50) – of the participants told they liked online classes because it allowed them to access the contents of their class later. Network problem 62.9 % (n=56) was the top reason for disliking online classes. India is the second-largest online market, with over 560 million internet users. However, the internet penetration rate in 2020 is only around 50 percent<sup>9</sup>. This means that only half of the country's population has access to the internet. The internet speed in India also poses a problem. The average mobile download speed is 12 Mbps, which is significantly lower than the global average of 35 Mbps. India ranks 130<sup>th</sup> in mobile and 71<sup>st</sup> in broadband usage globally.<sup>10</sup> This might be the cause of network problems experienced by the participants.

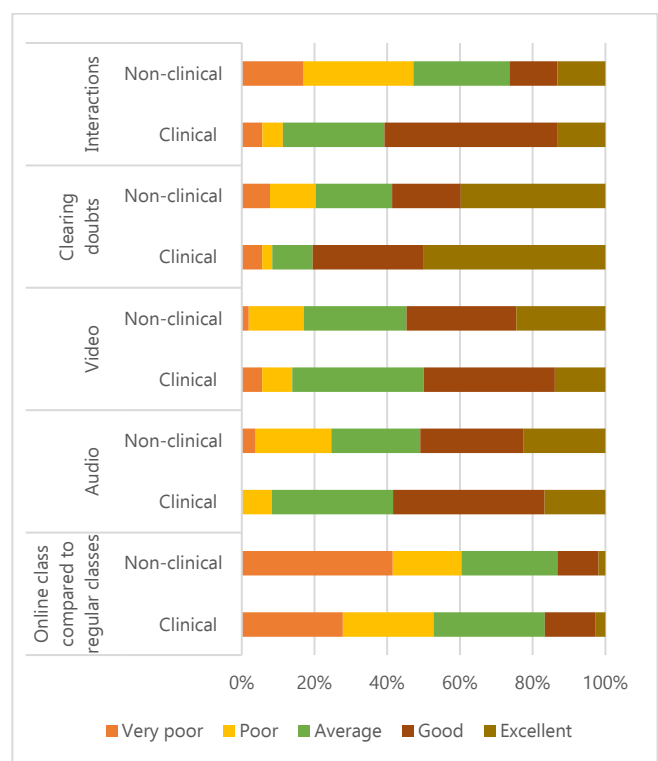
Another interesting observation was that even though the participants voted 'average' for interactions in their class, lack of interaction, felt by 62.9 % (n=56), was also the top reason for disliking online classes, which was equal to the network problem. Interaction is an essential characteristic and a critical indicator of an effective online class.<sup>11,12</sup> An interactive class requires participation from both teachers and students. Discussion via platforms, giving assignments and timely feedback may be useful. When conducting virtual classes, interacting with students personally, permitting them to ask questions or raise doubts, and encouraging them in chat participation may increase the overall effectiveness of the class.

Unfortunately, 36% (n=32) of the teachers felt that online classes were very poor when compared to regular classes. Medical subjects are often discussed with cases observed and studied inwards. Even theory topics are complex to understand. Adding

**Figure 2.** Duration of Classes and Time Taken for Preparation of Online Classes by the Medical Teachers (Clinical and Non-Clinical Teachers).



**Figure 3.** Opinions of Clinical and Non-Clinical Medical Teachers on Online Classes.



time constraints and network problems to this, and the overall efficiency of the online classes is reduced further. Online education is not inferior to regular classes. In a meta-analysis on undergraduate medical education, which included 16 studies, none concluded that online learning was less effective than regular learning<sup>13</sup>. Some aspects of online classes may not be as good as those of regular classes. However, this shortcoming can inspire students to develop self-learning capabilities through the internet<sup>13,14</sup>. There is a wide disparity in the resource types and

subjects. Addressing these will have good implications on online learning<sup>15</sup>. Mahadevan, a senior professor of Ophthalmology in Kerala, India, writes, "Online classrooms are here to stay and it has begun taking baby steps to become an integral part of education".<sup>16</sup> His view is consistent with our findings. Almost half of the participants – 49.4% (n=44) – wanted to continue online classes after COVID-19 lockdown compared with 12.4% (n=11) who did not want to continue.

Our study has some limitations. This was a one-sided study exploring only teachers' opinions. The sampling was not random, thus limiting the generalization of the results. The studied population is not representative of India nor those regions so results must be interpreted with care. There were no studies before the COVID-19 lockdown to compare our findings. We calculated the sample size of teachers and students to be 1:10. We anticipated 108 teachers and got 101 responses. However, we

included only two states in the country because firstly, these states were the first to start online classes and secondly, they were relatively easier to access for data collection during the lockdown.

Though India has some experience in online education, the country is not equipped to handle this sudden and massive transition. However, our survey finds that even though more participants had network problems and had to endure a lack of sufficient interaction, they wanted to continue online classes after the COVID-19 lockdown. This shows teachers' willingness to adapt and incorporate newer modalities into the curriculum. Nevertheless, if this is to succeed, educational institutions should improve their IT infrastructure and consider training teachers to conduct online classes more efficiently. They should also try to incorporate online classes into the curriculum. Further studies should be conducted to evaluate the efficiency of online education in India.

## References

1. Harapan H, Itoh N, Yufika A, Winardi W, Keam S, Te H, et al. Coronavirus disease 2019 (COVID-19): A literature review. *J Infect Public Health*. 2020 May;13(5):667-673.
2. WHO (World Health Organization). Coronavirus disease (COVID-19) Pandemic. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>. Last updated 11 July 2020; Cited 11 July 2020.
3. UNESCO (The United Nations Educational, Scientific and Cultural Organization). COVID-19 Impact on education. Available from: <https://en.unesco.org/covid19/educationresponse>. Last updated 11 July 2020; Cited 11 July 2020.
4. Percy M. Student, Teacher, Professor: Three Perspectives on Online Education. *Hist. Teach*. 2014 Feb;47(2):169–85.
5. Northrup PT. Online learners' preferences for interaction. *Q. Rev. Distance Educ*. 2002 Jun;3 (2): 219–226.
6. Vogelsang M, Rockenbauch K, Wrigge H, Heinke W, Hempel G. Medical Education for "Generation Z": Everything online?! - An analysis of Internet-based media use by teachers in medicine. *GMS J Med Educ*. 2018 May;35(2):Doc21.
7. Daniela P, Minet C, Herbst S, Albrecht. Use of Social Media and Online-Based Tools in Academia,- Science 2.0 Survey. Jun 2014 n.d., 101.
8. Panahi S, Watson J, Partridge H. Social media and physicians: Exploring the benefits and challenges. *Health Informatics J*. 2016 Jun;22(2):99-112.
9. Statista Research Department. Internet usage in India- Statistics & Facts. Available from: <https://www.statista.com/topics/2157/internet-usage-in-india>. Last updated 11 July 2020; Cited 11 July 2020.
10. India's Internet Speed Is Falling Since Jan 2020, Globally Rank 130th For Mobile Data Speed. Available from: <https://www.indiatimes.com/technology/news/indias-internet-speed-is-falling-since-jan-2020-globally-rank-130th-for-mobile-data-speed-510505.html>. Last updated 11 July 2020; Cited 11 July 2020.
11. Kalman YM, Ravid G, Raban D, Rafaeli S. Pauses and Response Latencies: A Chronemic Analysis of Asynchronous CMC. *J Comput Mediat Commun*. 2006 Oct;12(1), 1–23.
12. Kuo YC, Walker AE, Schroder KEE. Interaction, Internet self-efficacy, and self-regulated learning as predictors of student satisfaction in online education courses. *Internet High.Educ*, 2014 Jan;20, 35–50.
13. Pei L, Wu H. Does online learning work better than offline learning in undergraduate medical education? A systematic review and meta-analysis. *Med. Educ.*, 2019 Dec;24:1.
14. Friedman CP, Donaldson KM, Vantsevich AV. Educating medical students in the era of ubiquitous information. *Med Teach*. 2016 May;38(5):504–509
15. Kim KJ, Kim G. Development of e-learning in medical education: 10 years' experience of Korean medical schools. *Korean J Med Educ*. 2019 Sep;31: 205-214.
16. Mahadevana K, Nair TR. Aftermath of Covid's Foray Into The Educational Scene. *Kerala Medical Journal*. 2020;13(2):55-56.

---

**Acknowledgments**

We thank Dr Radhika for the language editing of final draft.

**Conflict of Interest Statement & Funding**

The Authors have no funding, financial relationships or conflicts of interest to disclose.

**Author Contributions**

Conceptualization – AT, KTS. Data Curation – AT, MTS, KTS, SSK, AS, CK, JPP, PMP, SSCH, AM, TZ, SD, VM, ST, MJK, SP. Formal Analysis – AT, MTS, KTS, SSK, AS, JPP. Investigation –AT, MTS, KTS, SSK, AS. Methodology – AT, KTS, SSK, AS. Software – AT, MTS, KTS, JPP. Project Administration, Resources, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing: AT, MTS, KTS.

**Cite as**

Thomas A, Shenoy MT, Kotacherry TS, Kumar SS, Sidheeque A, Khovidh C, et al. Teachers' View on Online Classes during the COVID-19 Lockdown – A Cross-Sectional Study. Int J Med Stud. 2022 Jan-Mar;10(1):32-37.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](#)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](#)



# Predictors of Early (0-7 Days) and Late (8-30 Days) Readmission in a Cohort of Acute Coronary Syndrome Patients

George Cholack,<sup>1</sup> Joshua Garfein,<sup>2</sup> Rachel Krallman,<sup>3</sup> Delaney Feldeisen,<sup>4</sup> Daniel Montgomery,<sup>3</sup> Eva Kline-Rogers,<sup>5</sup> Geoffrey D. Barnes,<sup>6</sup> Kim Eagle,<sup>7</sup> Melvyn Rubenfire,<sup>7</sup> Sherry Bumpus.<sup>8</sup>

## Abstract

**Background:** Readmissions following acute coronary syndrome are unevenly distributed across the 30-day post-discharge period. There is limited data on predictors of all-cause readmission in early (0-7 day) and late (8-30 day) post-discharge periods for this population; the purpose of this retrospective cohort study was to identify predictors of early and late readmission. **Methods:** Patients at Michigan Medicine (Ann Arbor, Michigan, United States) with a principal discharge diagnosis of unstable angina, ST-segment elevation myocardial infarction, or non-ST segment elevation myocardial infarction between April 2008 and November 2017 were identified. Predictors of early and late readmission were analyzed with multivariable logistic regression models. **Results:** Of 1120 patients hospitalized following acute coronary syndrome, 198 (17.68%) were readmitted within 30 days while 70 (6.25%) were readmitted within 7 days of discharge. Of 30-day readmissions, early readmissions were more likely in females [OR 2.26, 95% confidence interval (CI) 1.23, 4.16], non-white individuals ( $p=0.05$ ), or patients requiring intensive care unit admission during hospitalization (OR 2.20, 95% CI 1.14, 4.24). Relative to patients not readmitted within 7 days, patients who were female, had history of atrial fibrillation, principal discharge diagnosis of non-ST segment elevation myocardial infarction, or required intensive care unit admission were more likely readmitted early. History of congestive heart failure was a predictor of late readmission when compared to patients not readmitted in 30 days. **Conclusion:** Following acute coronary syndrome, predictors of readmission varied between early and late readmission groups. Readmission predictors provides healthcare providers with information useful in minimizing readmissions and concomitant financial penalties.

**Key Words:** Myocardial infarction; Unstable angina; Atrial fibrillation; Intensive care unit; Heart failure; Patient readmission (Source: MeSH-NLM).

## Introduction

Readmissions following an acute coronary syndrome (ACS) are not evenly distributed across the 30-day post-discharge period. To date, there is a dearth of research investigating predictors of early (0-7 day) and late (8-30 day) readmission in patients hospitalized for various types of acute coronary syndromes [unstable angina, ST-segment elevation myocardial infarction (STEMI), or non-ST segment elevation myocardial infarction (NSTEMI)]. Studies have shown that among patients with acute myocardial infarction, the majority of these 30-day readmissions occur within the first 14 days post-discharge, and a significant proportion occur within the first 7 days post-discharge.<sup>1-4</sup> Furthermore, Graham et al.<sup>5,6</sup> suggest that readmissions within

one week of discharge may be amenable to prevention. Other research investigating early (0-7 days) versus late (8-30 days) readmissions in general medicine and heart failure patients, suggests that unique subsets of characteristics may predict whether patients are more likely to be readmitted in the early or late readmission period.<sup>6,7</sup> Understanding why patients are readmitted at varying points during the 30-day post-discharge period is crucial for minimizing 30-day readmission rates, especially since hospitals with risk-adjusted readmission rates greater than average readmission rates following most ACS hospitalizations incur financial penalties through the Center for Medicare and Medicaid Services' Hospital Readmission Reduction Program.<sup>8</sup> While Dharmarajan et al.<sup>1</sup> illustrated that

<sup>1</sup> Medical student, MSc. Michigan Medicine, Department of Internal Medicine, Division of Cardiovascular Medicine, Ann Arbor, MI; Oakland University William Beaumont School of Medicine, Rochester, MI, United States.

<sup>2</sup> MPH. Michigan Medicine, Department of Internal Medicine, Division of Cardiovascular Medicine, Ann Arbor, MI, United States.

<sup>3</sup> BS. Michigan Medicine, Department of Internal Medicine, Division of Cardiovascular Medicine, Ann Arbor, MI, United States.

<sup>4</sup> BA. Michigan Medicine, Department of Internal Medicine, Division of Cardiovascular Medicine, Ann Arbor, MI, United States.

<sup>5</sup> NP. Michigan Medicine, Department of Internal Medicine, Division of Cardiovascular Medicine, Ann Arbor, MI, United States.

<sup>6</sup> MD, MSc. Michigan Medicine, Department of Internal Medicine, Division of Cardiovascular Medicine, Ann Arbor, MI, United States.

<sup>7</sup> MD. Michigan Medicine, Department of Internal Medicine, Division of Cardiovascular Medicine, Ann Arbor, MI, United States.

<sup>8</sup> PhD, FNP-BC. Michigan Medicine, Department of Internal Medicine, Division of Cardiovascular Medicine, Ann Arbor, MI; Eastern Michigan University, College of Health and Human Services, School of Nursing, Ypsilanti, MI, United States.

**About the Author:** George Cholack is currently a third-year medical student of Oakland University William Beaumont School of Medicine (Rochester, MI, United States) of a 4 year program. He completed a M.Sc. degree at the University of Michigan School of Public Health last year and was a TL1-funded scholar through the Michigan Institute for Clinical and Health Research's grant 5TL1R002242 from the National Center for Advancing Translational Sciences (NCATS).

## Correspondence:

Sherry M. Bumpus. <https://orcid.org/0000-0002-7812-5183>

Address: MCORRP, 24 Frank Lloyd Wright Dr. Lobby A; STE 3700; Room 3201, Ann Arbor, MI United States

Email: [sbumpus2@emich.edu](mailto:sbumpus2@emich.edu)

Editor: Francisco J. Bonilla-Escobar

Student Editors: Bahadar Srichawla & Ciara Egan

Copyeditor: Adnan Mujanovic

Proofreader: Adam Urback

Layout Editor: Anna-Maria Chantaliyska

Submission: May 27, 2021

Revisions: Jul 21, 2021

Responses: Aug 17, 2021

Acceptance: Nov 24, 2021

Publication: Jan 13, 2022

Process: Peer-reviewed

timing of 30-day readmissions following hospitalization for acute myocardial infarction did not vary substantively by age, sex, or race, it has yet to be investigated if there are predictors associated with differential risk of all-cause readmission in the early and late post-discharge periods following hospitalization for unstable angina, STEMI, or NSTEMI. As early readmissions may be more preventable, such predictors could be helpful to health systems aiming to maximally reduce 30-day readmission rates following ACS hospitalizations.

At Michigan Medicine (Ann Arbor, Michigan, United States), Bridging the Discharge Gap Effectively (BRIDGE), is a transitional care cardiology program with the purpose of reducing hospital readmission rates by ensuring that patients admitted with a cardiac diagnosis are seen by a nurse practitioner within 14 days post-discharge.<sup>9</sup> Despite overall lower 30-day readmission rates among BRIDGE attendees relative to non-attenders, roughly 50% of readmissions for patients with an index hospitalization of ACS occurred within 14 days of discharge.<sup>9</sup> Since ACS patients readmitted early often required rehospitalization prior to being able to attend BRIDGE, the purpose of this study was to identify clinical predictors of early and late all-cause readmission in this population.

## Methods

### Bridge Registry

The BRIDGE registry is a retrospective dataset of cardiac patients discharged from Michigan Medicine and referred to the BRIDGE clinic due to lack a scheduled cardiac follow-up within 14 days of discharge.<sup>10</sup> Details of the registry have been described elsewhere.<sup>9</sup> Briefly, the BRIDGE registry is a de-identified clinical database consisting of consecutive data that are extracted from an electronic medical record for all patients referred to the BRIDGE clinic. Data are abstracted manually by trained data abstractors, and 10% of all abstractions are audited for accuracy. Abstracted data includes patient demographics, past medical history, index admission and discharge data, and follow-up data within 6 months of index admission. This study was carried out in accordance with the principles outlined in the Declaration of Helsinki and its later amendments. The Human Subjects Internal Review Board of Michigan Medicine approved this study (HUM00035421) with a waiver of informed consent.

### Study Population and Outcomes

For this retrospective cohort study, patients enrolled in the BRIDGE registry between April 2008 and November 2017 were identified if they had a principal discharge diagnosis of ACS, which included: unstable angina, STEMI, and NSTEMI. The primary outcome of this study was time to readmission for any cause. Patients with unknown readmission status secondary to loss to follow-up were excluded. A separate analysis was conducted to identify the reasons for readmission, which were categorized as recurrent ACS, congestive heart failure (CHF), "other cardiac diagnosis", or "other non-cardiac diagnosis." Patients were stratified by time to readmission within 30 days and compared by

demographics, specific ACS principal discharge diagnosis (unstable angina, STEMI, NSTEMI), past medical history, readmission diagnosis, admission index factors (ICU admit during index, length of index stay, lab values during index admission), and mortality at 180 days post-discharge (**Figure 1**):

- 1) Early Readmissions (0-7 days) vs. Late Readmissions (8-30 days) (Boxes A vs. C)
- 2) Early Readmissions (0-7 days) vs. No Readmission within 7 days (Boxes A vs. B)
- 3) Late Readmissions (8-30 days) vs. No Readmission within 30 days (Boxes C vs. D)

### Statistical Analysis

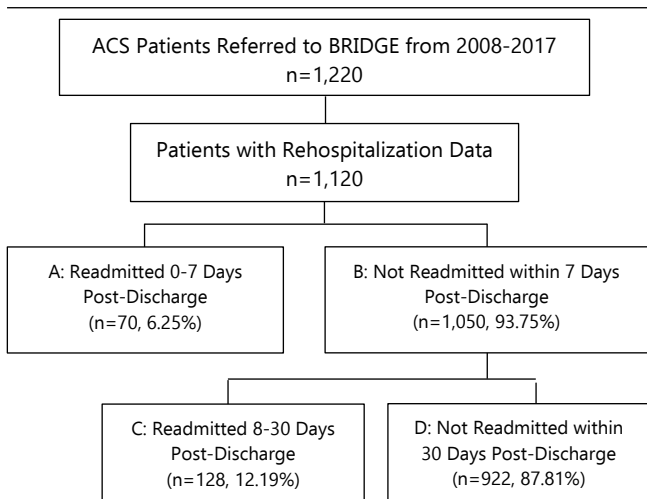
Data were analyzed using SPSS (IBM SPSS Statistics for Windows, Version 25.0. Armonk, New York: IBM Corporation). To compare early and late readmission groups, chi-square and two-tailed Mann-Whitney tests were used for categorical and continuous variables, respectively. Cases with missing data were excluded from analyses. Number of patients in each readmission subgroup with missing data for given variables are provided in **Supplemental Tables 2 and 3**. Since individual-level data were not available for income or education, the median household income<sup>11</sup> of each patient's zip code (based on a five-year average ending in 2016) was used as a proxy for socioeconomic status. Patients were considered "low socioeconomic status" if their residence was located in a zip code associated with a median household income less than the median household income for the State of Michigan. For the Charlson Comorbidity Index (CCI), a modified score was calculated based on similar assumptions utilized by Chang et al.<sup>12</sup> Admission to the intensive care unit (ICU) was based on the clinical needs of the patient as assessed both by the ICU physicians and nursing staff. Typically, this includes patients who required advanced respiratory or hemodynamic support as well as patients within the first 24 hours after a STEMI. A priori significance was set to  $\alpha=0.05$ . Multivariable logistic regression models were then created to identify potential independent predictors of early and late readmission. Bivariate analysis was first utilized to help identify variables as candidates for the models. After considering clinical relevance, variables with bivariate p-values  $\leq 0.15$  were considered for introduction to the model. A backward stepwise regression method was utilized as an aid to develop the final models. A Hosmer-Lemeshow test was used to determine goodness of fit, and the area under the ROC curve (C-statistic) was computed to describe the discriminatory power of each model. Odds ratios reported in final models are adjusted for all predictors retained in the model.

## Results

### Early Readmissions vs. Late Readmissions

Of 4879 patients referred to BRIDGE from April 2008 to November 2017, 1220 (25.4%) had a principal discharge diagnosis of ACS. Of 1120 ACS patients with rehospitalization data, 198 (17.7%) had an unplanned readmission within 30 days post-discharge (**Figure 1**). Of 30-day readmissions, 70 (35.4%)

Figure 1. Patient Flow Diagram.



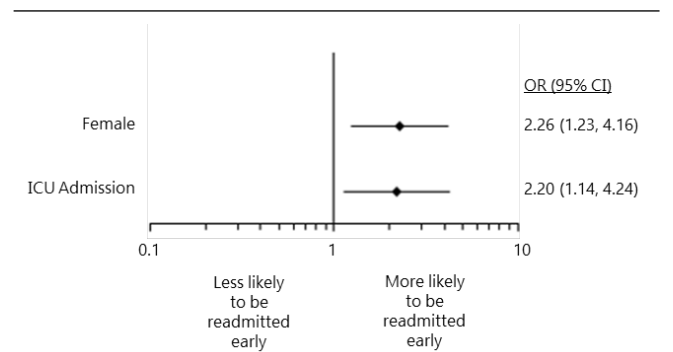
**Legend:** ACS (Acute coronary syndrome) Patients Referred to Bridging the Discharge Gap Effectively (BRIDGE) transitional care cardiology program were dichotomized into readmissions within 0-7 days post-discharge, and those not readmitted within 7 days. The latter group was further dichotomized into readmissions 8-30 days post-discharge and those not readmitted within 30 days post-discharge. Percentages in boxes A and B are fractions of the total number of ACS patients referred to BRIDGE who had rehospitalization data. Percentages in boxes C and D are percentages of ACS patients not readmitted within 7 days.

were readmitted early (*Supplemental Table 1*). Relative to late (8-30 day) readmissions, early readmissions (0-7 days) were more likely to be in females, non-white individuals, or patients requiring ICU admission during index hospitalization (*Supplemental Table 1*). No other differences between early and late readmission groups were observed with respect to demographics, type of ACS (unstable angina, NSTEMI, STEMI), past medical history, readmission diagnosis, other patient characteristics during index hospitalization, and all-cause mortality at 180 days post-discharge (*Supplemental Table 1*). Readmission diagnoses for early and late readmissions are provided in *Table 1* and *Supplemental Table 1*. Briefly, "other non-cardiac diagnosis" and "other cardiac diagnosis" were the predominant readmission diagnoses for early and late readmissions, respectively. After adjustment, female sex [OR 2.26, 95% confidence interval (CI) 1.23, 4.16], and index intensive care unit (ICU) admission (OR 2.20, 95% CI 1.14, 4.24) were all significant independent predictors of early readmission (C-statistic=0.633 and Hosmer-Lemeshow p-value = 0.78, *Figure 2*).

**Early Readmissions vs. No Readmissions in 7 days**

Of 1120 ACS patients with rehospitalization data, 70 (6.25%) were readmitted early (*Table 1*). Compared to patients not readmitted within the first 7 days, patients readmitted early were significantly older (roughly 4 years on average), more likely female, more likely to have history of atrial fibrillation, or have greater CCI scores. Furthermore, patients readmitted early were more likely to have been in the ICU during their index admission, have a longer overall hospital length of stay, present with lower hemoglobin

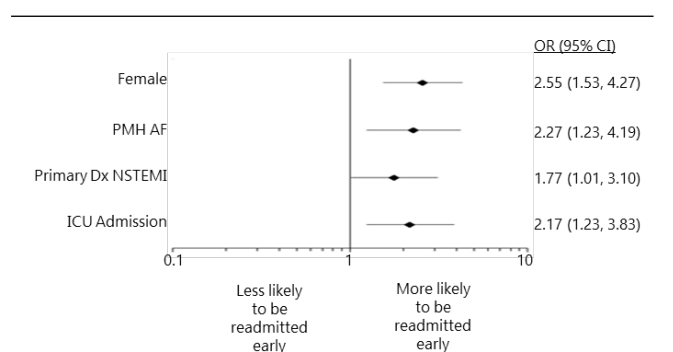
Figure 2. Multivariable Logistic Regression Model Comparing Early (0-7 Days) vs Late (8-30 Days) Readmissions.



**Legend:** Late readmissions was used as the reference group. Reported odds ratios are adjusted for sex and ICU admission. Abbreviations: ICU = intensive care unit; OR = odds ratio; CI = confidence interval.

and higher blood urea nitrogen levels upon index admission, and experience higher all-cause mortality over 180 days post-discharge (*Table 1*). After adjustment, female sex (OR 2.55, 95% CI 1.53, 4.27), past medical history of atrial fibrillation (OR 2.27, 95% CI 1.23, 4.19), principal discharge diagnosis of NSTEMI (OR 1.77, 95% CI 1.01, 3.10), and index ICU admission (OR 2.17, 95% CI 1.23, 3.83) were all significant independent predictors of early readmission among all ACS patients studied (C-statistic=0.677 and Hosmer-Lemeshow p-value = 0.91, *Figure 3*).

Figure 3. Multivariable Logistic Regression Model Comparing Early Readmission versus No Readmission in Seven Days (Reference Group).



**Legend:** Reported odds ratios are adjusted for sex, history of AF, principal discharge diagnosis of NSTEMI, and ICU admission. Abbreviations: PMH = past medical history; AF = atrial fibrillation; Dx = diagnosis; NSTEMI = non-ST segment elevation myocardial infarction; ICU = intensive care unit; OR = odds ratio; CI = confidence interval.

**Late Readmissions vs. No Readmissions in 30 days**

Of 1050 ACS patients who were not readmitted within 7 days, 128 (12.19%) were readmitted late (8-30 days after discharge) while 922 (87.81%) were not readmitted within the first 30 days (*Table 1*). Relative to non-readmissions, late readmissions were more likely to be in females, white patients, or patients requiring ICU admission during index hospitalization (*Table 1*). History of congestive heart failure (CHF) was a significant independent predictor of late readmission (C-statistic=0.65 and Hosmer-Lemeshow p-value = 0.69, *Figure 4*).

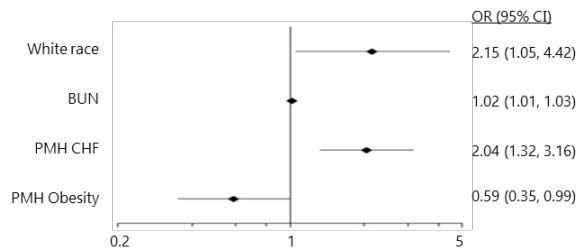


**Table 1.** Baseline Characteristics of Early Readmissions versus No Readmission within 7 days and Late Readmissions versus No Readmission within 30 Days.

|   | Early Readmissions (0-7 days) (n=70, 6.25%) | No Readmissions within 7 days (n=1050, 93.75%) | p-value | Late Readmissions (8-30 days) (n=128, 12.19%) | No Readmissions within 30 days (n=922, 87.81%) | p-value |
|---|---|--|---------|---|--|---------|
| <b>Demographics</b>   |   |  |         |   |  |         |
| Age (years), mean ± SD  | 67.20 ± 15.13                               | 63.54 ± 13.01                                  | 0.02    | 64.96 ± 12.87                                 | 63.34 ± 13.02                                  | 0.19    |
| Female, n (%)   | 40 (57.1)                                   | 354 (33.7)                                     | <0.001  | 50 (39.1)                                     | 304 (33.0)                                     | 0.17    |
| Married, n (%)  | 31 (57.4)                                   | 514 (64.6)                                     | 0.29    | 62 (66.0)                                     | 452 (64.4)                                     | 0.77    |
| Non-white, n (%)  | 12 (17.1)                                   | 133 (12.8)                                     | 0.57    | 10 (8.0)                                      | 123 (13.5)                                     | 0.09    |
| Low SES, n (%)  | 14 (20.6)                                   | 226 (23.6)                                     | 0.32    | 31 (26.7)                                     | 195 (23.2)                                     | 0.40    |
| <b>Principal Discharge Diagnosis, n (%)</b>                               |   |  |         |   |  |         |
| Unstable angina   | 7 (10.6)                                    | 180 (18)                                       | 0.13    | 21 (16.9)                                     | 159 (18.1)                                     | 0.75    |
| NSTEMI  | 42 (63.6)                                   | 535 (53.4)                                     | 0.11    | 64 (51.6)                                     | 471 (53.6)                                     | 0.67    |
| STEMI   | 17 (25.8)                                   | 287 (28.6)                                     | 0.62    | 39 (31.5)                                     | 248 (28.2)                                     | 0.46    |
| <b>Prevalence of comorbid conditions, n (%)</b>                           |   |  |         |   |  |         |
| AF/Atrial Flutter   | 17 (24.3)                                   | 132 (12.6)                                     | 0.01    | 19 (14.8)                                     | 113 (12.3)                                     | 0.41    |
| Aortic Stenosis   | 8 (11.4)                                    | 62 (5.9)                                       | 0.07    | 9 (7.0)                                       | 53 (5.7)                                       | 0.56    |
| Cerebrovascular Disease   | 14 (20.0)                                   | 140 (13.3)                                     | 0.12    | 20 (15.6)                                     | 120 (13.0)                                     | 0.42    |
| CHF   | 19 (27.1)                                   | 194 (18.5)                                     | 0.07    | 40 (31.3)                                     | 154 (16.7)                                     | <0.001  |
| Coronary Artery Disease   | 69 (98.6)                                   | 1021 (97.2)                                    | 0.50    | 125 (97.7)                                    | 896 (97.2)                                     | 0.76    |
| Diabetes Mellitus   | 25 (35.7)                                   | 364 (34.7)                                     | 0.86    | 52 (40.6)                                     | 312 (33.8)                                     | 0.13    |
| Hypertension  | 50 (71.4)                                   | 762 (72.6)                                     | 0.84    | 92 (71.9)                                     | 670 (72.7)                                     | 0.85    |
| ICD/Pacemaker   | 8 (11.4)                                    | 67 (6.4)                                       | 0.10    | 7 (5.5)                                       | 60 (6.5)                                       | 0.65    |
| Malignancy  | 12 (17.1)                                   | 163 (15.5)                                     | 0.72    | 25 (19.5)                                     | 138 (15)                                       | 0.18    |
| Obesity (BMI ≥ 30)  | 15 (21.4)                                   | 240 (22.9)                                     | 0.78    | 21 (16.4)                                     | 219 (23.8)                                     | 0.06    |
| Renal disease (acute or chronic)  | 20 (28.6)                                   | 223 (21.2)                                     | 0.15    | 42 (32.8)                                     | 181 (19.6)                                     | 0.001   |
| Pulmonary disease   | 29 (41.4)                                   | 348 (33.1)                                     | 0.16    | 48 (37.5)                                     | 300 (32.5)                                     | 0.26    |
| Vascular Disease  | 17 (24.3)                                   | 179 (17.0)                                     | 0.12    | 31 (24.2)                                     | 148 (16.1)                                     | 0.02    |
| Charlson Comorbidity Index, median (25 <sup>th</sup> , 75 <sup>th</sup> ) | 5.60 (3.93, 7.13)                           | 4.30 (3.00, 6.40)                              | 0.002   | 5.10 (3.70, 6.90)                             | 4.20 (3.00, 6.20)                              | 0.001   |
| <b>Patient characteristics during index hospitalization</b>               |   |  |         |   |  |         |
| Required ICU admission, n (%)   | 26 (37.7)                                   | 269 (25.7)                                     | 0.03    | 29 (23.0)                                     | 240 (26.1)                                     | 0.46    |
| Total length of stay, mean ± SD   | 5.03 ± 3.59                                 | 4.45 ± 4.89                                    | 0.003   | 5.55 ± 4.91                                   | 4.30 ± 4.87                                    | <0.001  |
| Hemoglobin on arrival, mean ± SD  | 12.54 ± 1.94                                | 13.55 ± 3.10                                   | <0.001  | 13.38 ± 6.91                                  | 13.58 ± 2.11                                   | <0.001  |
| Creatinine on arrival, mean ± SD  | 1.32 ± 1.22                                 | 1.21 ± 1.13                                    | 0.43    | 1.38 ± 1.27                                   | 1.18 ± 1.11                                    | 0.004   |
| BUN on arrival, mean ± SD   | 25.68 ± 16.54                               | 21.97 ± 12.74                                  | 0.01    | 26.33 ± 16.33                                 | 21.38 ± 12.06                                  | <0.001  |
| <b>Discharge Medications, n (%)</b>                                       |   |  |         |   |  |         |
| ACE inhibitor   | 40 (63.5)                                   | 632 (64.7)                                     | 0.85    | 72 (62.1)                                     | 560 (65.0)                                     | 0.53    |
| ARB   | 11 (15.9)                                   | 139 (13.4)                                     | 0.56    | 23 (18.3)                                     | 116 (12.8)                                     | 0.09    |
| P2Y <sub>12</sub> Inhibitor   | 45 (64.3)                                   | 776 (74.0)                                     | 0.07    | 96 (75.0)                                     | 680 (73.9)                                     | 0.79    |
| Aspirin   | 66 (94.3)                                   | 1004 (96.4)                                    | 0.38    | 121 (96.0)                                    | 883 (96.4)                                     | 0.84    |
| Beta Blocker  | 61 (88.4)                                   | 893 (86.2)                                     | 0.61    | 111 (87.4)                                    | 782 (86.0)                                     | 0.67    |
| CCB   | 11 (15.7)                                   | 176 (16.9)                                     | 0.80    | 19 (14.8)                                     | 157 (17.2)                                     | 0.51    |
| DTI   | 1 (1.9)                                     | 3 (0.4)  | 0.23    | 0 (0.0)                                       | 3 (0.4)  | >0.999  |
| Nitrate   | 27 (50.0)                                   | 458 (57.5)                                     | 0.28    | 59 (62.1)                                     | 399 (56.8)                                     | 0.33    |
| Statin  | 65 (94.2)                                   | 979 (95.0)                                     | 0.78    | 117 (93.6)                                    | 862 (95.1)                                     | 0.46    |
| Warfarin  | 11 (15.7)                                   | 111 (10.7)                                     | 0.20    | 18 (14.2)                                     | 93 (10.2)                                      | 0.17    |
| Xa inhibitor  | 0 (0.0)                                     | 16 (2.0)                                       | 0.62    | 3 (3.2)                                       | 13 (1.9)                                       | 0.40    |
| <b>Readmission Diagnoses, n (%)</b>                                       |   |  |         |   |  |         |
| Recurrent ACS   | 7 (10.0)                                    | -  | -       | 14 (10.9)                                     | -  | -       |
| CHF   | 7 (10.0)                                    | -  | -       | 14 (10.9)                                     | -  | -       |
| Other cardiac diagnosis   | 25 (35.7)                                   | -  | -       | 57 (44.5)                                     | -  | -       |
| Other non-cardiac diagnosis   | 28 (40.0)                                   | -  | -       | 37 (28.9)                                     | -  | -       |
| All-cause mortality at 180 days post-discharge, n (%)                     | 9 (12.9)                                    | 54 (5.3)                                       | 0.008   | 22 (17.9)                                     | 32 (3.5)                                       | <0.001  |

**Legend:** ACE = angiotensin converting enzyme; ACS = acute coronary syndrome; ARB = angiotensin II receptor blocker; BMI = body mass index; BUN = blood urea nitrogen; CCB = calcium channel blocker; CHF = congestive heart failure; DTI = direct thrombin inhibitor; ICU = intensive care unit; NSTEMI = non-ST segment elevation myocardial infarction; SES = socioeconomic status; STEMI = ST-segment elevation myocardial infarction; 25<sup>th</sup> = 25<sup>th</sup> percentile; 75<sup>th</sup> = 75<sup>th</sup> percentile.

**Figure 4.** Multivariable Logistic Regression Model Comparing Late Readmissions to No Readmission in 30 Days (Reference Group).



**Legend:** Reported odds ratios are adjusted for race, BUN upon admission, history of CHF, and history of obesity. Abbreviations: BUN = blood urea nitrogen; CHF = congestive heart failure; PMH = past medical history; OR = odds ratio; CI = confidence interval.

## Discussion

In this study, the purpose was to compare early and late readmissions in patients referred to BRIDGE following hospitalization with a principal discharge diagnosis of ACS (unstable angina, STEMI, NSTEMI) and identify clinical predictors of early and late readmission in this population. Three key findings were identified. First, there was a sex disparity with respect to readmission timing in this population. Second, principal discharge diagnosis of NSTEMI, past medical history of atrial fibrillation, and ICU admission were all significant independent predictors of early readmission among all studied patients. Finally, of all studied patients except early readmissions, history of CHF was predictive of late readmission.

Female ACS patients experienced greater rates of early readmission compared to males. This is consistent with other literature showing that women have a greater risk of 30-day readmission than men following hospitalization for acute myocardial infarction.<sup>2,3,13-16</sup> However, one study reported that younger women (<65 years) had higher 30-day readmission rates following an acute myocardial infarction compared to men,<sup>2</sup> but this same study, along with an additional study,<sup>1</sup> showed that readmission timing within 30 days was similar between sexes. Of ACS patients readmitted within 30 days, we found that females had roughly twice the odds of early readmission relative to men, suggesting a sex disparity in readmission timing. While it has been noted that females have worse outcomes following hospitalization for acute myocardial infarction with respect to mortality, length of stay, and readmissions through 1 year post-discharge, further research is needed to understand the implications of our finding in order to better inform discharge planning.<sup>2,13,17-19</sup> Such a targeted approach may provide an avenue for minimizing early readmissions that are potentially more preventable than late readmissions.<sup>5,6</sup>

Among all patients studied, we observed that having a past history of atrial fibrillation, principal discharge diagnosis of NSTEMI, or requiring ICU admission during index hospitalization were all significant independent predictors of early readmission. Atrial fibrillation has been shown to be associated with 30-day readmissions in several contexts including the following: development of atrial fibrillation during hospitalization for acute myocardial infarction, ACS patients with comorbid atrial

fibrillation, new-onset postoperative atrial fibrillation, and past history of atrial fibrillation in patients hospitalized with STEMI.<sup>20-24</sup> Similarly, other studies have shown that 30-day readmission rates are greater for NSTEMI compared to STEMI patients.<sup>25,26</sup> While our results were concordant with these studies, our study is one of the first to limit the analysis to the first 7 days (rather than first 30 days). These three characteristics likely represent a combination of recurrent and difficult-to-control conditions (e.g., rate control in atrial fibrillation) and patients with more complex underlying disease or comorbidities (NSTEMI and ICU admission).<sup>27-29</sup> Awareness of these early readmission predictors can potentially aid healthcare providers in effectively screening for patients who may require greater medical attention prior to discharge to prevent early readmission.

Finally, we observed that history of CHF was predictive of late, but not early, readmission. An abundance of literature has shown a direct relationship between history of CHF and 30-day readmission following an ACS.<sup>15,30</sup> However, we were unable to find any studies demonstrating a differential risk of readmission in the first 7 days versus 8-30 days following discharge for an ACS in patients with history of CHF. Recognizing predictors of late readmission in ACS patients and how they differ from early readmission predictors can aid healthcare providers in addressing the varying needs of patients when creating post-discharge plans aimed at minimizing a patient's risk of 30-day readmission.

Reduction of 30-day readmissions following acute myocardial infarction has been an area of interest for many health services researchers and health systems partly because of the Center for Medicare and Medicaid Services' Hospital Readmission Reduction Program, which penalizes hospitals with greater risk-adjusted readmission rates greater than average readmission rates for particular conditions.<sup>8</sup> While much research has been done to examine predictors of 30-day readmission in acute myocardial infarction patients, research investigating predictors of early and late readmission in the ACS population is limited. Such predictors of early and late readmission may provide health systems with additional information to guide readmission-reduction efforts on early readmissions that may be more preventable.<sup>5,6</sup> For example, as ICU admission was a significant predictor of early readmission in this study population, health systems seeking to minimize early readmissions following ACS hospitalization may find it beneficial to consider increased referral to post-ICU clinics following patient discharge.<sup>31,32</sup> Additional research is warranted to thoroughly characterize groups of acute coronary syndrome patients who may have greater susceptibility to readmission in a potentially more preventable time period (e.g., the first week of discharge). Moreover, future research could investigate predictors of early and late readmission in populations with other discharge diagnoses (cardiac and non-cardiac). Such work could help investigators determine if certain characteristics are associated with increased likelihood of early readmission, regardless of discharge diagnosis.

This study has important strengths. Since the BRIDGE registry has been maintained for more than 10 years, we had a large sample of ACS patients and a considerable number of these patients were

readmitted within 30 days of discharge. Additionally, as data were abstracted manually by trained data abstractors, we did not need to rely on patient recall for any information. Finally, we had access to a comprehensive amount of health information for each patient given the way data was abstracted from the electronic medical record.

There are also limitations of this analysis. As this is an observational study based on retrospective data, causality cannot be determined. Furthermore, the results of this study should be applied cautiously to other populations, as the BRIDGE registry may not be reflective of populations with different proportions of younger/older individuals, males/females, and individuals of varying racial/ethnic background. Information bias via misclassification must also be considered, since patients with multiple active conditions had to be categorized into a single principal discharge diagnosis. Lastly, because this registry is maintained within one institution, the registry may underreport readmission to outside sites.

In summary, among ACS patients referred for short-term transitional care follow-up who were readmitted within 30 days, early readmissions were more likely in females, non-white patients, or patients requiring ICU admission during index hospitalization. Other early readmission predictors were past medical history of atrial fibrillation and principal discharge diagnosis of NSTEMI while history of CHF was predictive of only late readmission. The predictor differences between readmission groups likely represent differences in urgency at which patients require medical attention to prevent readmission. While the results of this study highlight the need for rapid outpatient follow-up when available, this study does not indicate if additional length of stay during index would decrease readmission. This needs to be explored in future studies. Understanding factors that influence readmission timing provides healthcare professionals with additional information to reduce

readmissions, minimize financial penalties related to excessive readmissions, and improve quality of care for patients.

### Summary - Accelerating Translation

Acute coronary syndrome (ACS) is defined as any condition resulting from a sudden decrease in blood flow to the heart, such as heart attack. ACS is a common medical emergency requiring medical treatment, including hospital admission. Readmissions are also common among these patients, leading to increased health care costs. However, some readmissions may be avoidable, and some previous studies have suggested that readmissions occurring soon after hospital discharge (i.e. within one week) are more easily preventable. It has yet to be determined if any patient characteristics are associated with early readmissions (within 1 week of hospital discharge) compared to late readmissions (8-30 days after hospital discharge). The purpose of this study was to identify clinical predictors of early and late readmissions among ACS patients.

Patients hospitalized at Michigan Medicine due to ACS between April 2008 and November 2017 were included in this study. They were then divided into groups based on whether or not they were readmitted and the time to readmission (0-7 days after hospital discharge [early], or 8-30 days after hospital discharge [late]). Demographics, primary diagnosis, past medical history, readmission diagnosis, and hospitalization factors were compared between groups.

Of 1120 patients hospitalized following acute coronary syndrome, 198 (17.7%) patients were readmitted within the month following their discharge from the hospital. Most (128 patients; 64.6%) who were readmitted were readmitted late, between 8 and 30 days after hospital discharge. A smaller number (70 patients) were readmitted early, within the first 7 days of discharge (35.4%). Of all readmissions, early readmissions were more likely in females, non-white individuals, or patients requiring intensive care unit admission during hospitalization. Compared to patients not readmitted within 7 days, patients who were female, had history of a specific type of heart rhythm disturbance (atrial fibrillation), and a specific type of heart attack (non-ST segment elevation myocardial infarction) during the hospitalization, or required intensive care during their admission were more likely readmitted early. History of congestive heart failure was a predictor of late readmission when compared to patients not readmitted in 30 days.

The readmission predictors offered in this study may provide health systems with additional information to guide readmission-reduction efforts, potentially minimizing healthcare costs and improving quality of care for patients.

### References

- Dharmarajan K, Hsieh AF, Lin Z, Bueno H, Ross JS, Horwitz LI, et al. Diagnoses and timing of 30-day readmissions after hospitalization for heart failure, acute myocardial infarction, or pneumonia. *JAMA - J Am Med Assoc.* 2013;309(4):355-363.
- Dreyer RP, Ranasinghe I, Wang Y, Dharmarajan K, Murugiah K, Nuti SV, et al. Sex differences in the rate, timing, and principal diagnoses of 30-day readmissions in younger patients with acute myocardial infarction. *Circulation.* 2015;132(3):158-166.
- Ranasinghe I, Wang Y, Dharmarajan K, Hsieh AF, Bernheim SM, Krumholz HM. Readmissions after hospitalization for heart failure, acute myocardial infarction, or pneumonia among young and middle-aged adults: a retrospective observational cohort study. *PLoS Med.* 2014;11(9):e1001737.
- Kwok CS, Wong CW, Shufflebotham H, Brindley L, Fatima T, Shufflebotham A, et al. Early readmissions after acute myocardial infarction. *Am J Cardiol.* 2017;120(5):723-728.
- Graham KL, Dike O, Doctoroff L, Jupiter M, Vanka A, Davis RB, et al. Preventability of early vs. late readmissions in an academic medical center. *PLoS One.* 2017;12(6):e0178718.
- Graham KL, Auerbach AD, Schnipper JL, Flanders SA, Kim CS, Robinson EJ, et al. Preventability of early versus late hospital readmissions in a national cohort of general medicine patients. *Ann Intern Med.* 2018;168(11):766-774.
- Fudim M, O'Connor CM, Dunning A, Ambrosy AP, Armstrong PW, Coles A, et al. Aetiology, timing and clinical predictors of early vs. late readmission following index hospitalization for acute heart failure: insights from ascend-hf. *Eur J Heart Fail.* 2018;20(2):304-314.
- Centers for Medicare & Medicaid Services. Readmissions Reduction Program (HRPP). Available from: <https://www.cms.gov/medicare/medicare-fee-for-service-payment/acuteinpatientpps/readmissions-reduction-program.html>. Last updated August 6th, 2021; cited May 25th, 2021.

9. Bumpus SM, Krallman R, Kline-Rogers E, Montgomery D, Eagle KA, Rubenfire M. Transitional care to reduce cardiac readmissions: 5-year results from the bridge clinic. *J Fam Med Dis Prev.* 2017;3(3):3-9.
10. Bumpus SM, Brush BL, Pressler SJ, Wheeler J, Eagle KA, Rubenfire M. A transitional care model for patients with acute coronary syndrome. *Am J Accountable Care.* 2014;2(2):39-52.
11. United States Census Bureau. QuickFacts: Michigan. Available from: <https://www.census.gov/quickfacts/fact/table/MI/INC110219>. Last updated: unknown. Cited May 25th, 2021.
12. Chang CM, Yin WY, Wei CK, Wu CC, Su YC, Yu CH, et al. Adjusted age-adjusted charlson comorbidity index score as a risk measure of perioperative mortality before cancer surgery. *PLoS One.* 2016;11(2):e0148076.
13. O'Brien C, Valsdottir L, Wasfy JH, Strom JB, Secemsky EA, Wang Y, et al. Comparison of 30-day readmission rates after hospitalization for acute myocardial infarction in men versus women. *Am J Cardiol.* 2017;120(7):1070-1076.
14. Khera R, Jain S, Pandey A, Agusala V, Kumbhani DJ, Das SR, et al. Comparison of readmission rates after acute myocardial infarction in 3 patient age groups (18 to 44, 45 to 64, and ≥65 years) in the united states. *Am J Cardiol.* 2017;120(10):1761-1767.
15. Nguyen OK, Makam AN, Clark C, Zhang S, Das SR, Halm EA. Predicting 30-day hospital readmissions in acute myocardial infarction: the ami "readmits" (renal function, elevated brain natriuretic peptide, age, diabetes mellitus, nonmale sex, intervention with timely percutaneous coronary intervention, and low systolic blood pressure) score. *J Am Heart Assoc.* 2018;7(8):e008882.
16. Lemor A, Hernandez GA, Patel N, Blumer V, Sud K, Cohen MG, et al. Predictors and etiologies of 30-day readmissions in patients with non-st-elevation acute coronary syndrome. *Catheter Cardiovasc Interv.* 2018;93(3):373-379.
17. Dreyer RP, Dharmarajan K, Kennedy KF, Jones PG, Vaccarino V, Murugiah K, et al. Sex differences in 1-year all-cause rehospitalization in patients after acute myocardial infarction: a prospective observational study. *Circulation.* 2017;135(6):521-531.
18. Hess CN, Kaltenbach LA, Doll JA, Cohen DJ, Peterson ED, Wang TY. Race and sex differences in post-myocardial infarction angina frequency and risk of 1-year unplanned rehospitalization. *Circulation.* 2017;135(6):532-543.
19. Izadnegahdar M, Singer J, Lee MK, Gao M, Thompson CR, Kopec J, et al. Do younger women fare worse? sex differences in acute myocardial infarction hospitalization and early mortality rates over ten years. *J Women's Heal.* 2014;23(1):10-17.
20. Kim LK, Yeo I, Cheung JW, Swaminathan R V, Chiu Wong S, Charitakis K, et al. Thirty-day readmission rates, timing, causes, and costs after st-segment-elevation myocardial infarction in the United States: a national readmission database analysis 2010-2014. *J Am Heart Assoc.* 2018;7(18):e009863.
21. Kundu A, O'Day K, Shaikh AY, Lessard DM, Saczynski JS, Yarzebski J, et al. Relation of atrial fibrillation in acute myocardial infarction to in-hospital complications and early hospital readmission. *Am J Cardiol.* 2016;117(8):1213-1218.
22. Narasimhan B, Patel N, Chakraborty S, Bandyopadhyay D, Sreenivasan J, Hajra A, et al. Impact of atrial fibrillation on acute coronary syndrome—analysis of in-hospital outcomes and 30-day readmissions. *Curr Probl Cardiol.* 2020;46(4):100764.
23. Doshi R, Pisipati S, Taha M, Dave M, Shah J, Adalja D, et al. Incidence, 30-day readmission rates and predictors of readmission after new onset atrial fibrillation who underwent transcatheter aortic valve replacement. *Hear Lung.* 2020;49(2):186-192.
24. Lapar DJ, Speir AM, Crosby IK, Fonner E, Brown M, Rich JB, et al. Postoperative atrial fibrillation significantly increases mortality, hospital readmission, and hospital costs. *Ann Thorac Surg.* 2014;98(2):527-533.
25. Martin GP, Kwok CS, Van Spall HGC, Volgman AS, Michos E, Parwani P, et al. Readmission and processes of care across weekend and weekday hospitalisation for acute myocardial infarction, heart failure or stroke: an observational study of the national readmission database. *BMJ Open.* 2019;9(8):e029667.
26. Rodríguez-Padial L, Elola FJ, Fernández-Pérez C, Bernal JL, Bertomeu V, Iñiguez A. Patterns of inpatient care and readmission rates (30-day, 3-month and 1-year) in myocardial infarction in spain. differences between stemi and nstemi. *Rev Esp Cardiol.* 2018;71(9):757-758.
27. Van Gelder IC, Rienstra M, Crijns HJGM, Olshansky B. Rate control in atrial fibrillation. *Lancet.* 2016;388(10046):818-828.
28. Pollack CV, Amin A, Wang T, Deitelzweig S, Cohen M, Slattery D, et al. Contemporary nstemi management: the role of the hospitalist. *Hosp Pract.* 2020;48(1):1-11.
29. Amsterdam EA, Wenger NK, Brindis RG, Casey DE, Ganiats TG, Holmes DR, et al. 2014 aha/acc guideline for the management of patients with non-st-elevation acute coronary syndromes: a report of the american college of cardiology/american heart association task force on practice guidelines. *Circulation.* 2014;130(25):e344-e426.
30. Wang H, Zhao T, Wei X, Lu H, Lin X. The prevalence of 30-day readmission after acute myocardial infarction: a systematic review and meta-analysis. *Clin Cardiol.* 2019;42(10):889-898.
31. Kuehn BM. Clinics aim to improve post-icu recovery. *JAMA - J Am Med Assoc.* 2019;321(11):1036-1038.
32. Jensen JF, Thomsen T, Overgaard D, Bestle MH, Christensen D, Egerod I. Impact of follow-up consultations for icu survivors on post-icu syndrome: a systematic review and meta-analysis. *Intensive Care Med.* 2015;41(5):763-775.

---

**Acknowledgments**

The authors would like to acknowledge the Bridging the Discharge Gap Effectively clinic nurse practitioners for their hard work in the clinic and their contribution to the registry, as well as the M CORRP student interns, who have abstracted the majority of the clinical data since the Bridging the Discharge Gap Effectively Registry's inception. The authors would also like to acknowledge Stephanie Swanberg for her help in performing initial literature searches for this project.

**Conflict of Interest Statement & Funding**

Eva Kline-Rogers discloses consulting services to Janssen as well as being a member of the Board of Directors for Anticoagulation Forum. Geoffrey D Barnes discloses consulting fees from Pfizer/Bristol-Myers Squibb, Janssen, AMAG Pharmaceuticals and Acelis Connected Health. The remaining authors declare no conflicts of interest. George Cholack was supported by grant 5TL1R002242 from the National Center for Advancing Translational Sciences (NCATS), which is awarded to Michigan Institute for Clinical and Health Research at the University of Michigan, Ann Arbor, MI, USA.

**Author Contributions**

Formal Analysis, Investigation, Methodology: GC, JG, DM, GDB, SB. Funding Acquisition: GC, GDB, SB. Project Administration: GC, JG, RK, DF, EKR, GDB, KE, MR, SB. Software: GC, JG, DM. Supervision: RK, DF, DM, EKR, GDB, KE, MR, SB. Visualization: GC, JG, RK, DM, EKR, GDB, SB. Data Curation: JG, DM. Writing – Original Draft Preparation: GC, SB. Conceptualization, Resources, Validation, & Writing – Review & Editing: GC, JG, RK, DF, DM, EKR, GDB, KE, MR, SB.

**Cite as**

Cholack G, Garfein J, Krallman R, Feldeisen D, Montgomery D, Kline-Rogers E, et al. Predictors of Early (0-7 Days) and Late (8-30 Days) Readmission in a Cohort of Acute Coronary Syndrome Patients. *Int J Med Stud*. 2022 Jan-Mar;10(1):38-48.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](#)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](#)



## Supplementary Material

**Supplemental Table 1.** Baseline Characteristics of Early (0-7 day) versus Late (8-30) Readmissions.

|   | Early Readmissions<br>(0-7 days)<br>(n=70, 35.4%) | Late Readmissions<br>(8-30 days)<br>(n=128, 64.6%) | p-value |
|---|---|--|---------|
| <b>Demographics</b>   |   |  |         |
| Age (years), mean ± SD  | 67.20 ± 15.13                                     | 64.96 ± 12.87                                      | 0.27    |
| Female, n (%)   | 40 (57.1)   | 50 (39.1)  | 0.02    |
| Married, n (%)  | 31 (57.4)   | 62 (66.0)  | 0.30    |
| Non-white, n (%)  | 12 (17.1)   | 10 (8.0)   | 0.05    |
| Low SES, n (%)  | 14 (20.6)   | 31 (26.7)  | 0.35    |
| <b>Principal Discharge Diagnosis, n (%)</b>                               |   |  |         |
| Unstable angina   | 7 (10.6)  | 21 (16.9)  | 0.24    |
| NSTEMI  | 42 (63.6)   | 64 (51.6)  | 0.11    |
| STEMI   | 17 (25.8)   | 39 (31.5)  | 0.41    |
| <b>Prevalence of comorbid conditions, n (%)</b>                           |   |  |         |
| AF/Atrial Flutter   | 17 (24.3)   | 19 (14.8)  | 0.10    |
| Aortic Stenosis   | 8 (11.4)  | 9 (7.0)  | 0.29    |
| Cerebrovascular Disease   | 14 (20.0)   | 20 (15.6)  | 0.44    |
| CHF   | 19 (27.1)   | 40 (31.3)  | 0.55    |
| Coronary Artery Disease   | 69 (98.6)   | 125 (97.7)   | 0.66    |
| Diabetes Mellitus   | 25 (35.7)   | 52 (40.6)  | 0.50    |
| Hypertension  | 50 (71.4)   | 92 (71.9)  | 0.95    |
| ICD/Pacemaker   | 8 (11.4)  | 7 (5.5)  | 0.13    |
| Malignancy  | 12 (17.1)   | 25 (19.5)  | 0.68    |
| Obesity (BMI ≥ 30)  | 15 (21.4)   | 21 (16.4)  | 0.38    |
| Renal disease (acute or chronic)  | 20 (28.6)   | 42 (32.8)  | 0.54    |
| Pulmonary disease   | 29 (41.4)   | 48 (37.5)  | 0.59    |
| Vascular Disease  | 17 (24.3)   | 31 (24.2)  | 0.99    |
| Charlson Comorbidity Index, median (25 <sup>th</sup> , 75 <sup>th</sup> ) | 5.60 (3.93, 7.13)                                 | 5.10 (3.70, 6.90)                                  | 0.36    |
| <b>Patient characteristics during index hospitalization</b>               |   |  |         |
| Required ICU admission, n (%)   | 26 (37.7)   | 29 (23.0)  | 0.03    |
| Total length of stay, mean ± SD   | 5.03 ± 3.59                                       | 5.55 ± 4.91  | 0.87    |
| Hemoglobin on arrival, mean ± SD  | 12.54 ± 1.94                                      | 13.38 ± 6.91                                       | 0.49    |
| Creatinine on arrival, mean ± SD  | 1.32 ± 1.22                                       | 1.38 ± 1.27  | 0.38    |
| BUN on arrival, mean ± SD   | 25.68 ± 16.54                                     | 26.33 ± 16.33                                      | 0.81    |
| <b>Discharge Medications, n (%)</b>                                       |   |  |         |
| ACE inhibitor   | 40 (63.5)   | 72 (62.1)  | 0.85    |
| ARB   | 11 (15.9)   | 23 (18.3)  | 0.68    |
| P2Y <sub>12</sub> inhibitor   | 45 (64.3)   | 96 (75.0)  | 0.11    |
| Aspirin   | 66 (94.3)   | 121 (96.0)   | 0.58    |
| Beta Blocker  | 61 (88.4)   | 111 (87.4)   | 0.84    |
| Calcium Channel Blocker   | 11 (15.7)   | 19 (14.8)  | 0.87    |
| Direct Thrombin Inhibitor   | 1 (1.9)   | 0 (0.0)  | 0.36    |
| Nitrate   | 27 (50.0)   | 59 (62.1)  | 0.15    |
| Statin  | 65 (94.2)   | 117 (93.6)   | 0.87    |
| Warfarin  | 11 (15.7)   | 18 (14.2)  | 0.77    |
| Xa Inhibitor  | 0 (0.0)   | 3 (3.2)  | 0.55    |
| <b>Readmission Diagnoses, n (%)</b>                                       |   |  |         |
| Recurrent ACS   | 7 (10.0)  | 14 (10.9)  | 0.84    |
| CHF   | 7 (10.0)  | 14 (10.9)  | 0.84    |
| Other cardiac diagnosis   | 25 (35.7)   | 54 (42.2)  | 0.37    |
| Other non-cardiac diagnosis   | 28 (40.0)   | 37 (28.9)  | 0.11    |
| All-cause mortality at 180 days post-discharge, n (%)                     | 9 (12.9)  | 22 (17.9)  | 0.36    |

**Legend:** Abbreviations: ACE = angiotensin converting enzyme; ACS = acute coronary syndrome; ARB = angiotensin II receptor blocker; BMI = body mass index; BUN = blood urea nitrogen; CHF = congestive heart failure; ICU = intensive care unit; NSTEMI = non-ST segment elevation myocardial infarction; SES = socioeconomic status; STEMI = ST-segment elevation myocardial infarction; 25<sup>th</sup> = 25<sup>th</sup> percentile; 75<sup>th</sup> = 75<sup>th</sup> percentile.

**Supplemental Table 2.** Number of Cases with Missing Data for Each Variable for Each Readmission Subgroup from Table 1.

|   | Early Readmissions<br>(0-7 days)<br>(n=70, 6.25%) | No Readmissions<br>within 7 days<br>(n=1050,93.75%) | Late Readmissions<br>(8-30 days)<br>(n=128,12.19%) | No Readmissions<br>within 30 days<br>(n=922, 87.81%) |
|---|---|---|--|--|
| <b>Demographics</b>   |   |   |  |  |
| Age (years)   | 0   | 0   | 0  | 0  |
| Female  | 0   | 0   | 0  | 1  |
| Married   | 16  | 254   | 34   | 220  |
| Non-white   | 0   | 11  | 3  | 11   |
| Low SES   | 2   | 92  | 12   | 81   |
| <b>Principal Discharge Diagnosis</b>                        |   |   |  |  |
| Unstable angina   |   |   |  |  |
| NSTEMI  | 4   | 48  | 4  | 44   |
| STEMI   |   |   |  |  |
| <b>Prevalence of Comorbid Conditions</b>                    |   |   |  |  |
| AF/Atrial Flutter   | 0   | 2   | 0  | 3  |
| Aortic Stenosis   | 0   | 0   | 0  | 0  |
| Cerebrovascular Disease                                     | 0   | 0   | 0  | 0  |
| CHF   | 0   | 1   | 0  | 0  |
| Coronary Artery Disease                                     | 0   | 0   | 0  | 0  |
| Diabetes Mellitus   | 0   | 1   | 0  | 0  |
| Hypertension  | 0   | 0   | 0  | 0  |
| ICD/Pacemaker   | 0   | 3   | 1  | 0  |
| Malignancy  | 0   | 0   | 0  | 2  |
| Obesity (BMI ≥ 30)  | 0   | 2   | 0  | 2  |
| Renal disease (acute or chronic)                            | 0   | 0   | 0  | 0  |
| Pulmonary disease   | 0   | 0   | 0  | 0  |
| Vascular Disease  | 0   | 0   | 0  | 3  |
| Charlson Comorbidity Index                                  | 0   | 0   | 0  | 0  |
| <b>Patient characteristics during index hospitalization</b> |   |   |  |  |
| Required ICU admission                                      | 1   | 3   | 2  | 2  |
| Total length of stay  | 0   | 0   | 0  | 0  |
| Hemoglobin on arrival                                       | 0   | 0   | 0  | 0  |
| Creatinine on arrival                                       | 0   | 0   | 0  | 0  |
| BUN on arrival  | 0   | 0   | 0  | 0  |
| <b>Discharge Medications</b>                                |   |   |  |  |
| ACE inhibitor   | 7   | 73  | 12   | 60   |
| ARB   | 1   | 13  | 2  | 16   |
| P2Y <sub>12</sub> Inhibitor                                 | 0   | 1   | 0  | 2  |
| Aspirin   | 0   | 9   | 2  | 6  |
| Beta Blocker  | 1   | 14  | 1  | 13   |
| Calcium channel blocker                                     | 0   | 9   | 0  | 9  |
| Direct thrombin inhibitor                                   | 17  | 300   | 0  | 172  |
| Nitrate   | 16  | 253   | 33   | 220  |
| Statin  | 1   | 19  | 3  | 16   |
| Warfarin  | 64  | 13  | 1  | 10   |
| Xa inhibitor  | 7   | 250   | 34   | 238  |
| <b>Readmission Diagnoses</b>                                |   |   |  |  |
| Recurrent ACS   | 0   | -   | 0  | -  |
| CHF   | 0   | -   | 0  | -  |
| Other cardiac diagnosis                                     | 0   | -   | 0  | -  |
| Other non-cardiac diagnosis                                 | 0   | -   | 0  | -  |
| All-cause mortality at 180 days post-discharge              | 0   | 31  | 5  | 8  |

**Legend:** Abbreviations: ACE = angiotensin converting enzyme; ACS = acute coronary syndrome; AF = atrial fibrillation; ARB = angiotensin II receptor blocker; BMI = body mass index; BUN = blood urea nitrogen; CHF = congestive heart failure; ICU = intensive care unit; ICD = implantable cardiac defibrillator; NSTEMI = non-ST segment elevation myocardial infarction; SES = socioeconomic status; STEMI = ST-segment elevation myocardial infarction.

**Supplemental Table 3.** Number of Cases with Missing Data for Each Variable for Each Readmission Subgroup from Supplemental Table 1.

|   | Early Readmissions<br>(0-7 days)<br>(n=70, 35.4%) | Late Readmissions<br>(8-30 days)<br>(n=128, 64.6%) |
|---|---|--|
| <b>Demographics</b>   |   |  |
| Age (years)   | 0   | 0  |
| Female  | 0   | 0  |
| Married   | 16  | 34   |
| Non-white   | 0   | 3  |
| Low SES   | 2   | 12   |
| <b>Principal Discharge Diagnosis</b>                        |   |  |
| Unstable angina   |   |  |
| NSTEMI  | 4   | 4  |
| STEMI   |   |  |
| <b>Prevalence of Comorbid Conditions</b>                    |   |  |
| AF/Atrial Flutter   | 0   | 0  |
| Aortic Stenosis   | 0   | 0  |
| Cerebrovascular Disease                                     | 0   | 0  |
| CHF   | 0   | 0  |
| Coronary Artery Disease                                     | 0   | 0  |
| Diabetes Mellitus   | 0   | 0  |
| Hypertension  | 0   | 0  |
| ICD/Pacemaker   | 0   | 1  |
| Malignancy  | 0   | 0  |
| Obesity (BMI $\geq$ 30)                                     | 0   | 0  |
| Renal disease (acute or chronic)                            | 0   | 0  |
| Pulmonary disease   | 0   | 0  |
| Vascular Disease  | 0   | 0  |
| Charlson Comorbidity Index                                  | 0   | 0  |
| <b>Patient characteristics during index hospitalization</b> |   |  |
| Required ICU admission                                      | 1   | 2  |
| Total length of stay  | 0   | 0  |
| Hemoglobin on arrival                                       | 0   | 0  |
| Creatinine on arrival                                       | 0   | 0  |
| BUN on arrival  | 0   | 0  |
| <b>Discharge Medications</b>                                |   |  |
| ACE inhibitor   | 7   | 12   |
| ARB   | 1   | 2  |
| P2Y <sub>12</sub> Inhibitor                                 | 0   | 0  |
| Aspirin   | 0   | 2  |
| Beta Blocker  | 1   | 1  |
| Calcium channel blocker                                     | 0   | 0  |
| Direct thrombin inhibitor                                   | 17  | 0  |
| Nitrate   | 16  | 33   |
| Statin  | 1   | 3  |
| Warfarin  | 64  | 1  |
| Xa inhibitor  | 7   | 34   |
| <b>Readmission Diagnoses</b>                                |   |  |
| Recurrent ACS   | 0   | 0  |
| CHF   | 0   | 0  |
| Other cardiac diagnosis                                     | 0   | 0  |
| Other non-cardiac diagnosis                                 | 0   | 0  |
| All-cause mortality at 180 days post-discharge              | 0   | 5  |

**Legend:** Abbreviations: ACE = angiotensin converting enzyme; ACS = acute coronary syndrome; AF = atrial fibrillation; ARB = angiotensin II receptor blocker; BMI= body mass index; BUN = blood urea nitrogen; CHF = congestive heart failure; ICU = intensive care unit; ICD = implantable cardiac defibrillator; NSTEMI= non-ST segment elevation myocardial infarction; SES = socioeconomic status; STEMI = ST-segment elevation myocardial infarction.



# Clinical Elective Choices and Motivations for Future Career Specialty Selection of Medical School Trainees and Junior Doctors of the University of the West Indies, Jamaica

Jean Williams Johnson,<sup>1</sup> Leohrandra Graham,<sup>2</sup> Eric Williams,<sup>3</sup> Colleen Campbell,<sup>4</sup> Nidhi Thomas,<sup>5</sup> Maxine Gossell-Williams.<sup>6</sup>

## Abstract

**Background:** Clinical electives provide opportunities toward future careers. This study aimed to examine whether students at the University of the West Indies used clinical electives to help with specialization choice and determine factors that influence trainee decisions for specialty training. **Methods:** A cross-sectional prospective study was conducted between July 2019 and March 2020, at The University of the West Indies and the University Hospital of the West Indies involving senior medical students and junior doctors. Paper questionnaires were administered using convenience sampling. Participants voluntarily agreed and were kept anonymous. **Results:** 193 participants, aged 20 to 35 years, completed the questionnaire 133 (68.9%) females. Preferred electives were internal medicine specialties (80, 41.5%), then surgical specialties (53, 27.5%). Sixty-four (33.2%) participants reported using electives to gain experience for their future career; other reasons included filling knowledge gaps (101, 52.3%) and repeating failed clerkships (19, 9.8%). Career preferences included surgery (75, 40.8%), internal medicine (41, 22.3%), anesthetics (20, 10.4%), and obstetrics & gynecology (18, 9.3%). Males showed preference for surgical specialties ( $p=0.002$ ). Elective choice for determining career path significantly correlated with future likely specialty choice (likelihood ratio chi-square test (32)=98.37,  $p<0.001$ ). Motivational factors that correlated significantly with future likely specialty choices were intellectual challenge ( $p=0.025$ ), income ( $p=0.010$ ), prestige ( $p=0.015$ ) and working hours ( $p=0.012$ ). **Conclusions:** Of the participants surveyed, only 33.2% used clinical electives for their intended purpose of informing future career paths. Surgical specialties were the top selections for postgraduate training and intellectual challenge was the top motivational factor.

**Key Words:** Electives; Medical students; Career choices; Medical specialty (Source: MeSH-NLM).

## Introduction

Medical students and interns are faced with life changing decisions about their future career path as they approach the final stages of their training and these decisions are often uninformed.<sup>1,2</sup> For medical students trained in the Caribbean, future specialty considerations have only been reported for students in the first year of training;<sup>3</sup> however specialty choices are more informed by clinical year experiences.<sup>4</sup> The medical school curriculum of The University of the West Indies (UWI) is a programme with three pre-clinical and two clinical years of training. During the clinical years, students are required to complete two separate clinical elective periods; in the fourth year, they can do a three-to-five-week rotation and in the fifth year

they have a five-week rotation, both times in areas of their choice. These clinical electives were designed primarily to allow the students in their clinical years of training a chance to spend time in a specialty area that would help to better inform their selection of future career paths.<sup>5</sup> The primary purpose of this study was to examine whether the clinical electives were being used as intended that is to help with specialization choice and to determine the factors that influence trainee decisions for specialty training at The UWI.

Cross-sectional surveys studies conducted among final year undergraduate medical students confirmed that clinical electives designed to provide specialty exposure were rated as positively

<sup>1</sup> BSc (Hons) MB BS MSc DM (Emerg. Med), Postgrad Diploma Med Ed (Dundee), The Department of Surgery, Faculty of Medical Sciences, The University of the West Indies, Mona, Kingston, Jamaica.

<sup>2</sup> Bachelors of Basic Medical Science in Pharmacology, MSc in Biomedical Research, Faculty of Medicine, University of the West Indies, Mona, Kingston, Jamaica.

<sup>3</sup> BSc (Hons) MB BS MSc DM (Emerg. Med), The Department of Surgery, Faculty of Medical Sciences, The University of the West Indies, Mona, Kingston, Jamaica.

<sup>4</sup> BSc MSc (Forensic Toxicology) MBBS, The University Hospital of the West Indies Mona, Kingston, Jamaica.

<sup>5</sup> MBBS, The University of the West Indies, Faculty of Medical Sciences, Jamaica Medical Students' Association Standing Committee on Medical Education, International Federation of Medical Students' Associations, IFMSA.

<sup>6</sup> BSc, MPhil, PhD, Section of Pharmacology and Pharmacy, The University of The West Indies, Mona Campus, Kingston, Jamaica.

**About the Author:** Nidhi Thomas is 5<sup>th</sup> year medical student at the University of the West Indies, Kingston, Jamaica of a 5-year program. She is an active member of the Jamaica Medical Students' Association Standing Committee on Medical Education and is the recipient of JAMSA President's Award for Excellence 2018-2019 and JAMSA Council Member of the Year 2018-2019.

## Correspondence:

Jean Williams Johnson. <https://orcid.org/0000-0003-2967-6453>

Address: The University of the West Indies, Mona, Kingston 7, Jamaica, W.I.

Email: [jeanwilliamsjohnson@gmail.com](mailto:jeanwilliamsjohnson@gmail.com)

Editor: Shawn Albers

Student Editors: Bahadar Srichawla & Michael Tavolieri

Copyeditor: Mohamed Fahmy Doheim

Proofreader: Joseph Tonge

Layout Editor: Sajjad Ali

Submission: May 20, 2021

Revisions: Jun 10; Sep 6, 2021

Responses: Jun 29; Oct 23, 2021

Acceptance: Nov 3, 2021

Publication: Nov 4, 2021

Process: Peer-reviewed

influencing their career path decisions.<sup>6,7</sup> Similar findings were reported in a systematic review of twenty studies involving pre-clinical and clinical students, as well as interns from medical schools in the United States of America, United Kingdom, Poland, Switzerland and Australia.<sup>8</sup> Understanding the motivational factors that influence the career path decisions are also important as this information could be used by the university and health policy makers to make specialties that are underrated and require more doctors, more appealing. Previous studies that surveyed medical students in their senior years and interns suggest prestige, perceived quality of life and anticipated income are common considerations among these trainees in both developed and developing countries.<sup>9-14</sup> For example, the study by Alshahrani et al<sup>11</sup> reported that in a sample of 379 participants, 44.7% of the participants were influenced by lifestyle in making their career choice.

Although clinical electives designed to influence future career paths have been integral to the curriculum of the medical school at The UWI for more than twenty years, a search of the literature did not reveal any study evaluating their relevance in future career path decisions. There were also no studies examining the future career choices in this population of students. Our study aimed to address this dearth of information and may be important to support alignment of specialty training with the needs of the Caribbean. We designed a questionnaire for medical students and junior doctors to identify their elective choices, decisions surrounding future career paths and the motivating factors influencing these decisions of students trained at this institution.

## Methods

This was a cross-sectional questionnaire study using convenience sampling conducted at The UWI and the University Hospital of the West Indies (UHWI), Mona Campus. The enrollees were students in the clinical years of their programme (years 4 and 5), junior medical doctors within the first year (interns) and second year (Senior House Officers, SHO) following graduation from medical school. Senior House Officers are medical doctors who remain in hospital after the internship period, and this work period is a requirement for any medical doctor trained at The UWI intending on pursuing specialty training at The UWI. Recruitment took place from July 2019 to March 2020. Data from a similar study was used to calculate the sample size required. Alshahrani et al<sup>11</sup> reported that in a sample of three hundred and seventy-nine participants, 44.7% of the participants were influenced by lifestyle in making their career choice. Using this data, a required sample size of two hundred and thirty-eight was calculated as we hypothesized that 50% of our sample will select lifestyle as their main motivation for career choice. This was done at a 95% confidence interval level and beta error of 50%.

In order to get proportions reflective of the population, stratified sampling was used to determine the number of medical students, interns and SHOs that needed to be recruited. There are

approximately 500 medical students in fourth and fifth year, forty interns and forty SHOs. Using corresponding proportions and calculated sample size, the aim was to recruit two hundred and six medical students, sixteen interns and sixteen SHOs. Clinical rotations were suspended in March 2020, which restricted the sampling process.

Ethical approval was obtained from the UWI Ethics Committee (ECP 146,18/19) and informed consent was obtained prior to the completion of the questionnaire. The Deans office and the University Hospital's human resources department were asked to send out emails to inform the participant of the study. The different location of classes and meeting points were determined for the medical students. The information about the interns and SHOs location was obtained from the hospital human resources department.

Medical students were asked to complete the questionnaire before and after class times by the research assistant. The research assistant stood at the door and handed out and collected the questionnaires which were only given to students who agreed to be part of the study. The SHOs and interns were approached based on their work schedule and the questionnaires were completed and collected at the same time. The questionnaire consisted of two pages and included demographic items, last elective choice (this elective was chosen to reduce errors from recall bias) and questions asking participants to choose one specialty from a list of twenty-three for postgraduate training. This included nine surgery specialties (Cardiac, General, Neurosurgery, Orthopedics, Ophthalmology, Plastic, Anesthesiology, Thoracic and Urology), six internal medicine specialties (Dermatology, Family, Gerontology, Pediatrics, Rheumatology and Sports Medicine), Intensive Care Medicine, Emergency Medicine, Obstetrics and Gynecology, Medical Administration, Psychiatry, Public Health Medicine, Rehabilitation Medicine and Radiology.

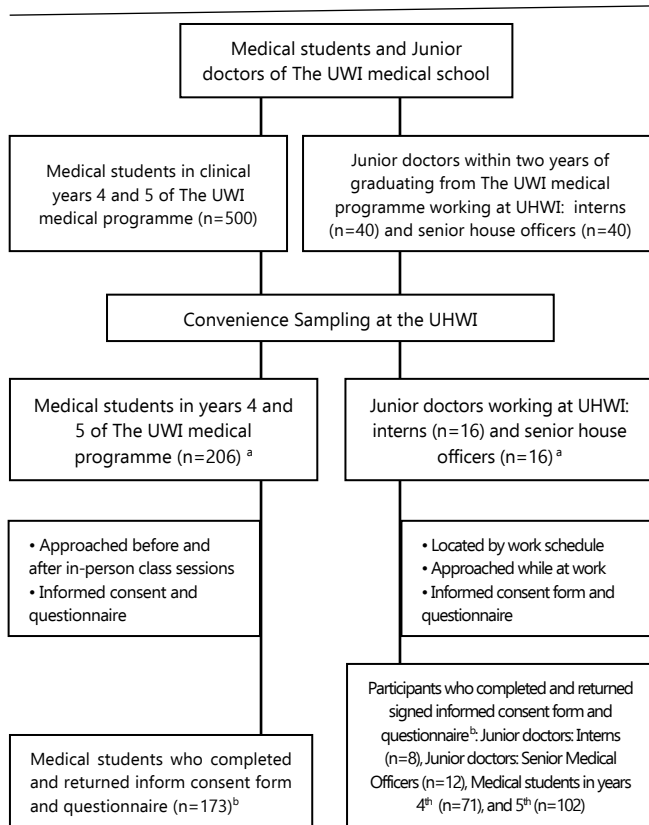
Each participant was given the opportunity to select three main reasons from a list of eleven career motivation factors for selecting that specialty for postgraduate training. For data analysis, these were grouped into career motivation factors of four intrinsic (described as enjoyment of and interest in professional activity): personal interest, role models, intellectual challenge and elective experience, four extrinsic (described as striving for promotion income or prestige): lifestyle, income, prestige and family influence, and three extraprofessional concerns: patient contact, working hours and job security. The questionnaire also delved into whether students wished to do post graduate studies and as well as where they wished to specialize. This included The UWI and common locations of interest in Caribbean students- United Kingdom, United States of America and Australia. Students were also given the option to state any other places they wish to specialize.

Data was analyzed with Statistical Package for Social Sciences (SPSS) software version 20. Correlation analysis was done to determine if there was any association between demographical data and specialty choice and motivational factors. Categorical variables were expressed as percentages; age of participants presented as median and range. Correlation between categorical variables was examined by chi-square test ( $\chi^2$ ); specifically, likelihood ratio chi-square test when the expected counts were below the amount required for Pearson's  $\chi^2$ . Differences between sexes used fisher's exact test. Statistical significance was recognized at  $p \leq 0.05$ .

## Results

**Table 1** shows demographic of the participants and information about their elective choices. One hundred and ninety-three medical students and doctors responded to the questionnaire. This included fourth year medical students (71, 36.8%), fifth year students (102, 52.8%), interns (8, 4.1%) and SHOs (12, 6.2%). One hundred and thirty-three (68.9%) of the respondents were female and the median age was twenty-three years old (range 20 to 35). Most of the participants were nationals of Caribbean islands with Jamaicans being the majority (144, 74.6%). The study was terminated due to the COVID-19 pandemic, with one hundred and seventy-three medical students (89.6%) and twenty junior doctors (10.4%) of the projected samples size (**Figure 1**).

**Figure 1.** Sampling Flow Chart.



**Legend:** <sup>a</sup>, Sample size calculated using Alshahrani et al.<sup>7</sup> <sup>b</sup>, Study terminated in March 2020 with the suspension of clinical rotations.

**Table 1.** Last elective experience and reasons given by students and junior doctors for selection (n=193).

| Characteristics  | n (%)      |
|--|------------|
| Age in years, Median (range)   | 23 (20-35) |
| Gender   |            |
| Male   | 8 (26.7)   |
| Female   | 163 (73.3) |
| Country of Nationality(missing data for 3)   |            |
| Caribbean Islands: Jamaica(144),Trinidad and Tobago (25), Barbados (5), St Kitts and Nevis (4), British Virgin Islands (2), Bahamas (1), Dominica (1), Cayman Islands (1), St Vincent and the Grenadines (1), Belize (1) | 185 (97.4) |
| Other Countries: United States of America (2), United Kingdom (1), Canada (1), Nigeria (1)   | 5 (2.6)    |
| Elective Specialty   |            |
| Internal medicine & Subspecialties: Pediatrics (9), Hematology (5), Cardiology (2), Infectious diseases (2), Pulmonary (1), Dermatology (1)  | 80 (41.5)  |
| Surgery & Subspecialties: Orthopedic (7), Ophthalmology (2), Urology (2), Neurosurgery (2), Pediatric surgery (2), Plastic surgery (2), Cardiothoracic (1)   | 53 (27.5)  |
| Combination electives: Internal medicine/Surgery (13), Internal medicine/Pathology (2), Internal medicine/Emergency medicine (2), Surgery/Pathology (1), Surgery/Radiology (1)   | 19 (9.8)   |
| Laboratory Medicine: Pathology (9), Microbiology (4)   | 13 (6.7)   |
| Community Health/Psychiatry  | 7 (3.6)    |
| Emergency Medicine   | 7 (3.6)    |
| Anesthesiology   | 5 (2.6)    |
| Obstetrics/Gynecology  | 4 (2.1)    |
| Radiology  | 3 (1.6)    |
| Independent study  | 1 (0.5)    |
| Specialty not reported   | 1(0.5)     |
| Reasons for selecting elective, n (%)  |            |
| To fill knowledge gap  | 101 (52.3) |
| Experience for future career path  | 64 (33.2)  |
| To repeat failed clerkship   | 19 (9.8)   |
| Little effort required   | 6 (3.1)    |
| Other  | 3 (1.6)    |

The questionnaire asked participants to indicate the specialty selected for the last elective completed. Some participants reported a single elective experience that combined two specialties. The most common specialty elective completed by participants were internal medicine and its subspecialties (80, 41.5%), followed by surgery and its subspecialties (53, 27.5%) (**Table 1**). Only sixty-four (33.2%) of the participants reported electives being used as intended; that is, to gain experiences for future career path. Most participants used elective experiences to fill knowledge gap (101, 52.3%), followed by to repeat failed clerkship (19, 9.8%). Other reasons for selecting the elective

choice were preparation for United States Medical Licensing Examination (USMLE) (2,1.1%) and no choice due to administrative reasons (1,0.5%).

Only one hundred and eighty-four (95.3%) participants completed this second section of the questionnaire. There was a greater preference for the specialties of Surgery (75, 40.8%), Internal Medicine (41, 22.3%), Anesthetics (20, 10.4%) and

Obstetrics/Gynecology (18, 9.3%). Analysis between sexes showed that had a preference for surgical specialties (Fisher's exact test  $p=0.002$ , **Table 2**). When the participants were divided by reason for the elective specialty choice, only those that used the elective to future career path exposure showed significant correlation with specialty choice (likelihood ratio  $\chi^2(32)= 98.37$ ,  $p<0.001$ ). There was a significant association between specialty choices and sex (likelihood ratio  $\chi^2(4)= 10.89$ ,  $p=0.028$ , **Table 3**).

**Table 2.** Choice of specialty for postgraduate training based on sex (n=184; missing data for 9 participants).

| Specialty Choice   | n (%)     | Male (n=59) | Female (n=125) | Fisher's exact p |
|--|-----------|-------------|----------------|------------------|
| Surgery: Orthopedic surgery (25), General surgery (14), Ophthalmology (10), Plastic surgery (7), Urology (6), Cardiac surgery (5), Neurosurgery (2), Thoracic surgery (2), Cardiothoracic surgery (5) Otolaryngology (2), Traumatology (1) | 75 (40.8) | 34          | 41             | 0.002*           |
| Internal medicine: Pediatrics (14), Internal medicine (3), Dermatology (9), Family medicine (8), Rheumatology (3), Sports medicine (2), Cardiology (1), Nephrology (1), Pulmonary (1)  | 41(21.2)  | 9           | 32             | 0.132            |
| Anesthesiology/Intensive Care  | 20(10.9)  | 5           | 15             | 0.187            |
| Obstetrics/Gynecology  | 18(9.8)   | 3           | 15             | 0.614            |
| Other Specialties: Emergency medicine (9), Public Health (4), Radiology (6), Psychiatry (3), Pathology (2), Medical administration (1)   | 30 (16.3) | 8           | 22             | 0.530            |

**Legend:** \* Significant deference between gender.

**Table 3.** Association of elective specialty with future career path across reason for choice of elective.

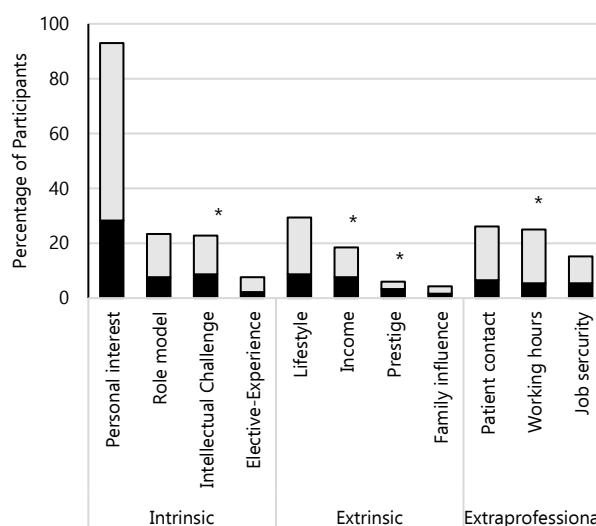
| Reason for choice of elective     | Likelihood ratio $\chi^2$ | df | p        |
|-----------------------------------|---------------------------|----|----------|
| To fill knowledge gap             | 28.45                     | 24 | 0.242    |
| Experience for future career path | 98.37                     | 32 | <0.0001* |
| To repeat failed clerkship        | 14.12                     | 20 | 0.824    |
| Little effort required            | 12.14                     | 10 | 0.276    |
| Other                             | 3.82                      | 2  | 0.148    |

**Legend:** df: degrees of freedom; \* significant correlation between elective specialty and future career choice.

The location of future study was also assessed. The UWI has three campuses for graduate training within the Caribbean region, Jamaica, Barbados and Trinidad. Ninety (48.9%) participants indicated where they would complete future postgraduate studies; ninety-nine (53.8%) participants were undecided. For those with international preference, the top three choices were schools in the United States of America (28, 51.9%) the United Kingdom (20, 37%) and Canada (4,7.4%).

The questionnaire explored future career path motivation factors for participants' choice of a particular specialty. Participants were asked to select 3 out of 11 career motivation factors; 499 selections were made (**Figure 2**). Personal interest, an intrinsic motivation was the main factor (171/270, 92.9%), followed by

**Figure 2.** Career motivation factors for Specialty choice (n=184) represented by male (black portion) and female (grey portion) of each bar.



**Legend:** Each participant was required to select three choices, a total of 499 choices were made. Motivational factors were group into intrinsic (n=270), extrinsic (n=107) and extra-professional (122). Likelihood ratio  $\chi^2$  analysis showed significant association with between specialty choice and intellectual challenge (11.12,  $p=0.025$ ), income (13.18,  $p=0.010$ ), prestige (12.27,  $p=0.015$ ) and working hours (12.79,  $p=0.012$ ); degrees of freedom=4. Likelihood ratio  $\chi^2$  analysis showed significant association with between gender and selection of at least one extra-professional motivation (5.95,  $p=0.015$ ).

lifestyle, an extrinsic motivation (54/107, 29.3%) and patient contact, an extra-professional motivation (48/122, 26.1%) were the main factor selected. Likelihood ratio  $\chi^2$  analysis (degrees of freedom=4) identified statistically significant association between specialty choice and income (13.18,  $p=0.010$ ), prestige (12.27,  $p=0.015$ ), working hours (12.79,  $p=0.012$ ) and intellectual challenge (11.12,  $p=0.025$ ). When motivational factors were grouped as intrinsic, extrinsic and extraprofessional concerns, there was a significant association between sex and selection of extra-professional concerns (5.95,  $p=0.015$ ) with 27 (45.7%) of males and 81(64.8%) of females selecting at least one extra-professional concern (patient contact, working hours and job security); no sex association was identified for intrinsic or extrinsic career motivations. For the seventy-five participants who chose surgical specialties for future career path, assessment of the motivational factors by sex showed no association with intrinsic, extrinsic or extra-professional concerns.

## Discussion

The participation of senior medical students in electives focused on improving transition to specialty training is an aspect of the curriculum of many medical schools worldwide; however, the successes reported with achieving this objective vary.<sup>7-8</sup> To our knowledge, this is the first study to report on the usefulness of the clinical elective to medical school trainees and junior doctors trained in the Caribbean.

This convenience sampling study carried out at The University of the West Indies, Jamaica medical school revealed that the majority of the participants chose to spend their elective time in internal medicine and the relevant subspecialties, followed by surgery and relevant subspecialties. Most of the participants used the elective to support educational deficiencies, rather than exploring future career paths. Only about thirty percent of the students used the chosen elective as it was intended, that is, to experience an area for possible postgraduate training. Furthermore, the selected future career choices by participants using electives as intended showed significant correlation. Thus, the objectives can be achieved, but there is a need for interventions to support the choice students make.

This study examined the choice of future career path: Surgical specialties was the most selected career path followed by Internal Medicine with both representing more than sixty percent of the group. These two specialties feature in the top five choices among medical students in their clinical training years worldwide<sup>9-18</sup> and thus our participants are showing similar preferences. Intrinsic motivations were the most common factors influencing for future career paths with personal interest being the top choice, which is consistent with other reports involving clinical medical students.<sup>16-19</sup> There was a noted correlation between specialty choice and income, prestige, and working hours; these findings are consistent with the recently published meta-analysis study of Yang et al of seventy-five cross-sectional studies, which included medical students from North America, Europe, Asia,

Oceania, Africa and South America.<sup>21</sup> However, Yang et al did not report intellectual challenges as a significant motivator of career selection, which was a finding among the participants of this study. The importance of this motivation among our students is an interesting finding and needs to be explored.

Studies among medical students in their senior clinical years of training have shown sex influences the choice of future career paths. Further analysis of the specialty preference of our sample, identified a significantly greater percentage of males selecting surgical specialty than females. We did not set out to stratify sampling by sex; however, the proportion of males to females does align with reports of McCartney et al of our Medical school.<sup>22</sup> Although our study is limited in sample size and sampling method, the finding is consistent with a large cross-sectional study of similar medical students in eleven Latin American countries, which showed that female students were less likely to select surgical specialty as a future career path with the exception of Pediatric surgery.<sup>23</sup> In reviews of sex difference among medical student selection of future career paths, the evidence that more females are represented in the medical profession than males is a worldwide trend and their interest in surgical specialties is known to be impacted by sex-bias discrimination, including lack of encouragement by the medical schools and extra-professional concerns as deterrents, including the need to balance having children and family life.<sup>24-26</sup> We identified an association by sex with the extra-professional concerns with more females selecting these motivational factors (job security, patient contact and working hours) for their future career path, other studies have highlighted these as important for female medical student decisions.<sup>10, 27</sup> We did not find any sex-based association with motivational factors for participants who selected surgical specialties and therefore unable to posit a reason for the greater representation of males. An assessment of deterrents to this career path should be considered in future studies among this population of medical students.

Overall, the study identified that less than half of the students were using electives to decide career paths; however, to improve alignment with the intended objectives, interventions are required. Several examples of successful mentorship models have been reported for other medical schools.<sup>29,30</sup> In a systematic review of medical schools in the United States of America, thirty published studies which satisfied the inclusion criteria, suggested that both single mentor-mentee and group mentorship models improved matching of medical students with specialty training.<sup>30</sup>

## Limitations

Convenience sampling restricts the generalizability of the study. Possible bias could have been formed given not all eligible medical students and junior doctors participated in this study. All students are required to complete two electives before graduating; as the study was done among fourth year medical students who would have only completed one elective and junior doctors, who would have completed these electives more than

one year before the study, the questionnaire was restricted to the last elective completed to reduce the possible errors with recall bias. The possible influence of first elective choices on the second elective choices of participants, was not assessed in this study. Moreover, on review of the questionnaires, we found nine students who did not complete questions regarding their single choice of specialty, the three main reasons for their choice of specialty, where they planned on specializing and where they would choose to study if they planned on studying abroad. The projected sample size was not attained, mainly as a result of the *Coronavirus* pandemic which suspended all clinical rotations in March 2020.

### Conclusions

This is the first study reporting on the use of the clinical elective rotations in the setting of a Caribbean Medical School. The study

suggested that when used as was intended, the elective may support the future career path selection of medical students. The areas of choice for future career paths were surgical specialties followed by internal medicine specialties with males more likely to select the former specialty. Personal interest was the motivational factor for most participants' specialty selection, specialties preferred by most females related to their extra-professional motivations. The finding does provide evidence that intervention is needed to ensure objectives of elective rotations are met and for career counseling to be instituted in order to advise senior medical students and junior doctors of their options for postgraduate training.

### References

- Hauer KE, Durning SJ, Kernan WN, Fagan MJ, Mintz M, O'Sullivan PS et al. Factors associated with medical students' career choices regarding internal medicine. *JAMA*. 2008 Sep 10;300(10):1154-64.
- Navarro AM, Taylor AD, Pokorny AP. Three innovative curricula for addressing medical students' career development. *Academic Medicine*. 2011 Jan 1;86(1):72-6.
- Baboolal NS, Hutchinson GA. Factors affecting future choice of specialty among first-year medical students of the University of the West Indies, Trinidad. *Medical Education*. 2007;41(1):50-6.
- Jones MD, Yamashita T, Ross RG, Gong J. Positive predictive value of medical student specialty choices. *BMC medical education*. 2018 Dec;18(1):1-7.
- Branday JM, Carpenter RA. The evolution of undergraduate medical training at the University of the West Indies, 1948-2008. *West Indian Med J*. 2008 Dec 1;57(6):530.
- Andrews MA, Paolino ND, DeZee KJ, Hemann B. Perspective of the graduating medical student: the ideal curriculum for the fourth year of undergraduate medical education. *Military medicine*. 2016 Nov 1;181(11-12):e1455-63.
- Van den Broek WS, Wijnen-Meijer M, Ten Cate O, Van Dijk M. Medical students' preparation for the transition to postgraduate training through final year elective rotations. *GMS journal for medical education*. 2017;34(5).
- Marshall DC, Salciccioli JD, Walton SJ, Pitkin J, Shalhoub J, Malietzis G. Medical student experience in surgery influences their career choices: a systematic review of the literature. *Journal of surgical education*. 2015 May 1;72(3):438-45.
- Alawad AA, Khan WS, Abdelrazig YM, Elzain YI, Khalil HO, Ahmed OB, Adam OA. Factors considered by undergraduate medical students when selecting specialty of their future careers. *Pan African Medical Journal*. 2015;20(1).
- Lefevre JH, Roupret M, Kerneis S, Karila L. Career choices of medical students: a national survey of 1780 students. *Medical Education*. 2010;44(6):603-12.
- Alshahrani M, Dhafery B, Al Mulhim M, Alkhadra F, Al Bagshi D, Bukhamsin N. Factors influencing Saudi medical students and interns' choice of future specialty: a self-administered questionnaire. *Advances in medical education and practice*. 2014;5:397
- Kanmounye US, Temgoua M, Endomba FT. Determinants of residency program choice in two central African countries: an internet survey of senior medical students. *International Journal of Medical Students*. 2020 Apr 30;8(1):20-5.
- Ali A, Rasheed A, Zaidi SM, Alsaani SM, Naim H, Hamid H, Farrukh S. Recent Trend in Specialty Choices of Medical Students and House Officers from Public Sector Medical Universities, Karachi. *JPMA*. 2019 Apr;69(489).
- Onyemaechi NO, Bisi-Onyemaechi AI, Omoke NI, Odetunde OI, Okwesili IC, Okwara BO. Specialty choices: Patterns and determinants among medical undergraduates in Enugu Southeast Nigeria. *Nigerian journal of clinical practice*. 2017;20(11):1474-80.
- Rukewe A, Abebe WA, Fatiregun AA, Kgantshang M. Specialty preferences among medical students in Botswana. *BMC research notes*. 2017 Dec;10(1):1-5.
- Dossajee H, Obonyo N, Ahmed SM. Career preferences of final year medical students at a medical school in Kenya—A cross sectional study. *BMC medical education*. 2016 Dec;16(1):1-10.
- Aslam M, Ali A, Taj T, Badar N, Mirza W, Ammar A, Muzaffar S, Kauten JR. Specialty choices of medical students and house officers in Karachi, Pakistan. *EMHJ-Eastern Mediterranean Health Journal*. 2011; 17 (1):74-79.
- Kumar, R., & Dhaliwal, U. Career choices of undergraduate medical students. *The National medical journal of India*. 2011;24(3):166-169.
- AbouZaid L, Nabil N, Al-Fadil S, Alatmi A, Saeed AA. Career choice and its influencing factors: perception of senior medical students. *J Contemp Med Educ*. 2014;2(3):168-73.
- Abdulrahman M, Makki M, Shaaban S, Al Shamsi M, Venkatramana M, Sulaiman N, Sami MM, Abdelmannan DK, Salih AM, AlShaer L. Specialty preferences and motivating factors: A national survey on medical students from five uae medical schools. *Education for Health*. 2016 Sep 1;29(3):231.
- Yang Y, Li J, Wu X, Wang J, Li W, Zhu Y, Chen C, Lin H. Factors influencing subspecialty choice among medical students: a systematic review and meta-analysis. *BMJ open*. 2019 Mar 1;9(3):e022097.
- McCartney, T., Lee, M. G., Roberts, R., & SinQuee, C. (2019). Tracking Medical Graduates in Jamaica and The Bahamas. *West Indian Medical Journal*. 2019; 68(1):47-52.
- Ng-Sueng LF, Vargas-Matos I, Mayta-Tristán P, Pereyra-Eliás R, Montenegro-Idrogo JJ, Inga-Berrosipi F, Ancalli F, Bonilla-Escobar F, Diaz-Velez C, Gutierrez-Quezada E, Gomez-Alhach J. Gender associated with the intention to choose a medical specialty in medical students: a cross-sectional study in 11 countries in Latin America. *PLoS one*. 2016 Aug 12;11(8):e0161000.
- Riska, E. Gender and medical careers. *Maturitas*. 2011; 68(3): 264-267.

25. Peel, J. K., Schlachta, C. M., & Alkhamisi, N. A. (2018). A systematic review of the factors affecting choice of surgery as a career. *Canadian Journal of Surgery*. 2018; 61(1):58-67.
26. Trinh, L. N., O'Rorke, E., & Mulcahey, M. K. Factors Influencing Female Medical Students' Decision to Pursue Surgical Specialties: A Systematic Review. *Journal of Surgical Education*. 2020;78(3):838-849.
27. van Tongeren-Alers, M., van Esch, M., Verdonk, P., Johansson, E., Hamberg, K., & Lagro-Janssen, T. Are new medical students' specialty preferences gendered? Related motivational factors at a Dutch medical school. *Teaching and learning in medicine*. 2011;23(3):263-268.
28. Organisation for Economic Co-operation and Development (OECD) /The World Bank. "Health Care Resources and Activities", in *Health at a Glance: Latin America and the Caribbean 2020*. OECD Publishing, Paris. 2020.
29. Hur Y. Development of a career coaching model for medical students. *Korean journal of medical education*. 2016 Mar;28(1):127.
30. Farkas AH, Allenbaugh J, Bonifacino E, Turner R, Corbelli JA. Mentorship of US medical students: a systematic review. *Journal of general internal medicine*. 2019 Nov;34(11):2602-9.

### Acknowledgments

None.

### Conflict of Interest Statement & Funding

The Authors have no funding, financial relationships or conflicts of interest to disclose.

### Author Contributions

Conceptualization: JWH, MGW; Data Curation: JWH, LG, MGW; Investigation: LG,CC,NT; Methodology: JWH, LG; Project Administration: JWH, EW, MGW; Resources: LG; Software: LG, MGW; Supervision: JWH; Validation: LG, MGW; Visualization: JWH, LG, EW, MGW; Writing – Original Draft Preparation: JWH, MGW; Writing – Review & Editing: JWH, MGW.

### Cite as

Johnson JW, Graham L, Williams E, Campbell C, Thomas N, Gossell-Williams M. Clinical Elective Choices and Motivations for Future Career Specialty Selection of Medical School Trainees and Junior Doctors of The University of the West Indies, Jamaica. *Int J Med Stud*. 2022 Jan-Mar;10(1):49-55.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://open.library.pitt.edu/)



# Medical Student Teleconferencing Experiences and Financial Status: A Cross-Sectional Survey

Ivy A. Huang,<sup>1</sup> Yasmeen Dhindsa,<sup>2</sup> Alina J. Chen,<sup>3</sup> James Wu,<sup>1</sup> Justin P. Wagner,<sup>1</sup> Areti Tillou,<sup>4</sup> Formosa Chen.<sup>5</sup>

## Abstract

**Background:** Teleconferencing issues may affect the online experiences of medical students during medical education and residency interview evaluation. Yet, teleconferencing experiences among medical students with varying financial status have not been examined. **Methods:** Cross-sectional study based on a single-institution survey of fourth-year University of California Los Angeles (UCLA) medical students on self-reported financial status, teleconferencing issues experienced, preparations made for online residency interviews, and satisfaction with teleconferencing equipment. Responses of students who self-identified as financially disadvantaged were compared to those of students without financial hardship using Fisher's exact tests. **Results:** Of 268 students invited to complete the survey, 67 responded (25%), and 27 (40%) of respondents identified as financially disadvantaged. A majority of students reported problems with internet connectivity (75%) and audio quality (51%). Nearly one-third of students (30%) reported plans to improve their internet connectivity for online residency interviews. Of respondents, 58% were satisfied with the quality of their teleconferencing equipment. Students dissatisfied with their equipment were more likely to report audio problems (68% vs. 38%,  $P=0.03$ ) and internet connectivity issues (89% vs. 64%,  $P=0.01$ ). Financial status was not significantly associated with teleconferencing issues, device age, satisfaction with teleconferencing equipment, or the amount that students would be willing to spend on acquiring new equipment. **Conclusion:** Teleconferencing issues, particularly audio and internet problems, are highly prevalent among fourth-year medical students at UCLA and are associated with dissatisfaction with teleconferencing equipment but not self-reported financial status. The influence of teleconferencing issues on student evaluation outcomes warrants further investigation.

**Key Words:** Financial stress; Internet; Medical education; Medical students; Videoconferencing (Source: MeSH-NLM).

## Introduction

Due to the Coronavirus Disease 2019 (COVID-19) pandemic, teleconferencing was applied broadly to medical student classes, meetings, and residency interviews. In May of 2020, the Coalition for Physician Accountability recommended that all United States residency programs conduct applicant interviews remotely during the 2020-2021 recruitment cycle.<sup>1</sup> Acknowledging the potential effect of teleconferencing factors on interview performance, the Association of American Medical Colleges (AAMC) and American Association of Colleges of Osteopathic Medicine (AACOM) published recommendations on optimizing self-presentation while teleconferencing.<sup>2-5</sup> However, students with financial hardship may have fewer resources to adhere to these recommendations.

The COVID-19 pandemic has disproportionately affected economically disadvantaged populations with an unequal impact on employment and mortality, underscoring a need to scrutinize how financially disadvantaged medical students may be unduly

affected by the shift to online platforms.<sup>6-8</sup> Although online interviews benefit applicants by eliminating travel and lodging expenses, optimizing teleconferencing experiences with high-quality technology such as modern laptop computers can be costly, and access may vary. Consequently, a student's financial ability to purchase new teleconferencing equipment or upgrade existing equipment may affect whether they experience teleconferencing issues during learning opportunities and high-stakes assessments such as residency interviews.

For instance, teleconferencing factors such as lighting, audio quality, and internet connectivity can affect a participant's voice and appearance, which play a role in how they are perceived by others.<sup>9-11</sup> As interviews are a critical yet subjective component of the resident selection process, many organizations released guidelines to help students optimize their online presentation.<sup>12-17</sup> Recommendations included reducing distracting noises, using Ethernet cables to avoid unstable internet connection, and investing in high-quality equipment. Consequently, a student's

<sup>1</sup> MD, University of California Los Angeles David Geffen School of Medicine, Los Angeles, CA, USA.

<sup>2</sup> BS, University of California Los Angeles David Geffen School of Medicine, Los Angeles, CA, USA.

<sup>3</sup> BA, University of California Los Angeles David Geffen School of Medicine, Los Angeles, CA, USA.

<sup>4</sup> MD, MEd, University of California Los Angeles David Geffen School of Medicine, Los Angeles, CA, USA.

<sup>5</sup> MD, MPH, University of California Los Angeles David Geffen School of Medicine, Los Angeles, CA, USA.

**About the Author:** Yasmeen Dhindsa is currently a fourth-year medical student at the University of California Los Angeles David Geffen School of Medicine, a four-year medical degree program in Los Angeles, California, USA.

## Correspondence:

Ivy A. Huang, <https://orcid.org/0000-0003-1697-075X>

Address: University of California Los Angeles David Geffen School of Medicine, Los Angeles, CA, USA.

Email: [ihuang@mednet.ucla.edu](mailto:ihuang@mednet.ucla.edu)

Editor: Francisco J. Bonilla-Escobar

Student Editors: Adam Urback, Leah Komer

Copyeditor: Kiera Liblik

Proofreader: Ciara Egan

Layout Editor: Sushil Dahal

Submission: Apr 5, 2020

Revisions: May 8, 2020

Responses: Apr 2, 2020

Acceptance: Aug 25, 2020

Publication: Dec 14, 2020

Process: Peer-reviewed



financial means not only potentially affects their teleconferencing experiences but may also influence how they are perceived by instructors and residency program interviewers. However, no existing studies have investigated the association of financial status with teleconferencing issues experienced by medical students.

In this study, we characterized the teleconferencing experiences of fourth-year medical students at University of California Los Angeles (UCLA) and determined whether there was an association between self-reported financial status and teleconferencing issues. We further examined whether medical students were satisfied with their teleconferencing experiences and what resources students considered useful for future residency interviews.

## Methods

We conducted a cross-sectional online survey of fourth-year medical students at the UCLA David Geffen School of Medicine (DGSOM) to evaluate demographic characteristics, teleconferencing experiences, and resources required.

### Setting and Participants

Over a two-week period in October of 2020, we emailed an online survey to all UCLA DGSOM medical students in the Class of 2021 student directory using an institutional email list. The inclusion criterion was fourth-year medical students participating in the 2020-2021 National Residency Matching Program (NRMP). We excluded junior classes of medical students as they would not have been actively preparing for online residency interviews. Fourth-year medical students that were not participating in the NRMP this academic year were also excluded. Random sampling was not conducted, as we aimed to elicit a broad variety of perspectives and teleconferencing experiences from students to maximize the richness of data collected. The survey instrument was hosted on the Qualtrics platform (Qualtrics, Provo, UT), and was anonymous, confidential, and voluntary. This study was reviewed and granted an exemption by the University of California Los Angeles Institutional Review Board (IRB #20-001623).

### Survey Design

The authors developed the survey items, piloted the survey with five medical students, and revised the questions based on student feedback prior to administering the survey to the target study population. The complete survey instrument is available as **Supplementary Material 1**.

In the survey, participants provided demographic information and whether they self-identified as financially disadvantaged. Respondents described the type of teleconferencing equipment they planned to use for residency interviews and the age of their devices. Survey items included teleconferencing issues experienced during online classes and meetings (such as problems with internet or audio quality), plans to prepare for

online interviews, satisfaction with existing equipment, and the amount of money one would be willing to spend on additional or new equipment. Survey participants were asked to indicate whether specific resources, such as equipment to borrow, would be useful if provided by their medical school.

### Study Outcomes

We compared responses of students who self-identified as financially disadvantaged to responses of students who did not. The primary outcome was the proportion of students experiencing teleconferencing problems. Secondary outcomes included satisfaction with existing teleconferencing equipment and plans to purchase new equipment. We additionally compared responses of students who were satisfied with the quality of their teleconferencing equipment with responses of students who were not satisfied. In this analysis, the primary outcome was the proportion of students experiencing teleconferencing problems. Lastly, we assessed the proportion of participants who perceived a variety of potential teleconferencing resources to be useful for residency interviews.

### Statistical Analysis

We compiled descriptive statistics for demographic data and reported the mean and standard deviation (SD) for parametric data. To compare groups of survey respondents, independent samples t-tests were applied to continuous variables, and Fisher's exact tests and Pearson's chi-squared tests were applied to categorical variables with binary and multiple outcomes, respectively. Participants who did not disclose whether they were financially disadvantaged were excluded from the analyses which compared financially disadvantaged students to students who were not financially disadvantaged. Kendall's correlation test was used to assess the association between device age and satisfaction with the quality of teleconferencing equipment. We presented descriptive statistics of whether students reported that specific resources would be useful for interviews.  $P$  values of  $<0.05$  were considered statistically significant. We conducted all analyses using the R programming language (RStudio, Boston, MA).

## Results

Of 268 students contacted for the survey, 67 (25%) responded. Among the 67 respondents, 27 (40%) self-identified as financially disadvantaged, while 9 (13%) preferred not to answer. Self-reported financial disadvantage was associated with race ( $P < 0.01$ ) and Hispanic ethnicity ( $P < 0.01$ ) (**Table 1**).

Nearly all students (99%, 66 of 67) owned their teleconferencing equipment, and 91% (61 of 67) planned to use a laptop to conduct online residency interviews (**Table 2**). The mean device age was 3.3 years (SD: 1.8). Of the 67 respondents, 50 (75%) reported internet connectivity issues and 34 (51%) had audio problems during teleconferencing, with many experiencing daily or weekly problems with internet connectivity (48%) and audio (34%). Over half (51%) reported challenges with finding a quiet or private space for classes and meetings and 42 (63%) had purchased

**Table 1.** Demographic Characteristics of Fourth-Year Medical Student Survey Respondents, UCLA, 2020.

| Characteristic                    | All students (n=67) <sup>a</sup> | Financially disadvantaged (n=27) | Not financially disadvantaged (n=31) | p-value |
|-----------------------------------|----------------------------------|----------------------------------|--------------------------------------|---------|
| Gender, n (%)                     |                                  |                                  |                                      | 0.80    |
| Female                            | 34 (51)                          | 15 (56)                          | 16 (52)                              |         |
| Male                              | 32 (48)                          | 12 (44)                          | 15 (48)                              |         |
| Prefer not to answer              | 1 (2)                            | 0 (0)                            | 0 (0)                                |         |
| Age in years, mean (SD)           | 28 (2)                           | 28 (2)                           | 27 (2)                               | >0.99   |
| Race, n (%) <sup>b</sup>          |                                  |                                  |                                      | <0.01   |
| White American                    | 20 (30)                          | 6 (21)                           | 12 (34)                              |         |
| Asian American                    | 22 (33)                          | 3 (11)                           | 17 (49)                              |         |
| Black or African American         | 13 (19)                          | 9 (32)                           | 4 (11)                               |         |
| American Indian and Alaska Native | 2 (3)                            | 2 (7)                            | 0 (0)                                |         |
| Other                             | 7 (11)                           | 4 (14)                           | 2 (6)                                |         |
| Prefer not to answer              | 8 (12)                           | 4 (14)                           | 0 (0)                                |         |
| Ethnicity, n (%)                  |                                  |                                  |                                      | <0.01   |
| Hispanic or Latinx                | 18 (27)                          | 13 (48)                          | 3 (10)                               |         |
| Not Hispanic or Latinx            | 46 (69)                          | 14 (52)                          | 28 (90)                              |         |
| Prefer not to answer              | 3 (5)                            | 0 (0)                            | 0 (0)                                |         |
| Financially disadvantaged, n (%)  |                                  |                                  |                                      | -       |
| Yes                               | 27 (40)                          | -                                | -                                    |         |
| No                                | 31 (46)                          | -                                | -                                    |         |
| Prefer not to answer              | 9 (13)                           | -                                | -                                    |         |

**Legend:** Abbreviation: SD, standard deviation. <sup>a</sup> Respondent numbers of all students do not equal the sum of respondent numbers of financially disadvantaged and not financially disadvantaged students, as 9 students declined to answer the survey question on financial status. <sup>b</sup> Respondent numbers of all students do not equal the sum of respondent numbers of race categories as some respondents identified with multiple categories of race.

**Table 2.** Associations Between Self-Reported Medical Student Financial Status and Teleconferencing Equipment, Experiences, and Preparations for Residency Interviews, UCLA, 2020.

| Characteristic   | All students (n=67) <sup>a</sup> | Financially disadvantaged (n=27) | Not financially disadvantaged (n=31) | p-value |
|--|----------------------------------|----------------------------------|--------------------------------------|---------|
| Device type, n (%)   |                                  |                                  |                                      | >0.99   |
| Laptop   | 61 (91)                          | 26 (96)                          | 29 (94)                              |         |
| Desktop  | 6 (9)                            | 1 (4)                            | 2 (6)                                |         |
| Owner of device, n (%)   |                                  |                                  |                                      | 0.47    |
| Me   | 66 (99)                          | 26 (96)                          | 31 (100)                             |         |
| Friend or family   | 1 (2)                            | 1 (4)                            | 0 (0)                                |         |
| Device age in years, mean (SD)   | 3.3 (1.8)                        | 2.7 (1.6)                        | 3.1 (1.7)                            | 0.37    |
| Satisfied with owned equipment, n (%)  | 39 (58)                          | 15 (56)                          | 21 (68)                              | 0.42    |
| Problems experienced while teleconferencing, n (%)                                 |                                  |                                  |                                      |         |
| Internet connectivity issues, any  | 50 (75)                          | 21 (78)                          | 20 (64)                              | 0.38    |
| Daily or weekly  | 32 (48)                          | 13 (48)                          | 13 (42)                              | 0.79    |
| Poor lighting  | 50 (75)                          | 20 (74)                          | 23 (74)                              | >0.99   |
| Audio problems, any  | 34 (51)                          | 12 (44)                          | 16 (52)                              | 0.61    |
| Daily or weekly  | 23 (34)                          | 8 (30)                           | 10 (32)                              | >0.99   |
| Inability to find a quiet location   | 34 (51)                          | 14 (52)                          | 15 (48)                              | >0.99   |
| Inability to join a meeting  | 10 (15)                          | 5 (19)                           | 1 (3)                                | 0.09    |
| Purchased or planned to purchase new equipment, n (%)                              | 42 (63)                          | 15 (56)                          | 20 (65)                              | 0.59    |
| Average dollar amount spent or willing to spend on new equipment, mean, \$USD (SD) | 149 (214)                        | 89 (65)                          | 175 (230)                            | 0.08    |
| Preparations and plans for online interviews, n (%)                                |                                  |                                  |                                      |         |
| Adjust the camera to eye level   | 59 (88)                          | 25 (93)                          | 27 (87)                              | 0.68    |
| Alter lighting   | 58 (87)                          | 24 (89)                          | 26 (84)                              | 0.71    |
| Select a quiet location  | 56 (84)                          | 22 (82)                          | 27 (87)                              | 0.72    |
| Change background  | 51 (76)                          | 20 (74)                          | 24 (77)                              | >0.99   |
| Use earphones  | 37 (55)                          | 14 (52)                          | 17 (55)                              | >0.99   |
| Improve internet connectivity  | 20 (30)                          | 6 (22)                           | 10 (32)                              | 0.56    |
| Use plug-in webcam   | 12 (18)                          | 4 (15)                           | 7 (23)                               | 0.52    |
| Use plug-in microphone   | 6 (1)                            | 1 (4)                            | 4 (13)                               | 0.36    |
| Use headphones   | 4 (1)                            | 3 (11)                           | 1 (3)                                | 0.33    |

**Legend:** Abbreviation: SD, standard deviation. <sup>a</sup> Respondent numbers of all students do not equal the sum of respondent numbers of financially disadvantaged and not financially disadvantaged students, as 9 students declined to answer the survey question on financial status.

**Table 3.** Association of Satisfaction with Teleconferencing Equipment with Medical Student Characteristics and Teleconferencing Issues Experienced, UCLA, 2020.

| Characteristic                                     | Satisfied with equipment (n = 39) | Not satisfied with equipment (n = 28) | p-value |
|--|-----------------------------------|---------------------------------------|---------|
| Age in years, mean (SD)                            | 28 (2)                            | 28 (2)                                | 0.38    |
| Gender, n (%)                                      |                                   |                                       |         |
| Female   | 18 (46)                           | 16 (57)                               | 0.46    |
| Male   | 21 (54)                           | 12 (43)                               |         |
| Race, n (%)  |                                   |                                       | 0.73    |
| White American                                     | 13 (33)                           | 7 (25)                                |         |
| Asian American                                     | 15 (38)                           | 7 (25)                                |         |
| Black or African American                          | 8 (21)                            | 5 (18)                                |         |
| American Indian or Alaskan Native                  | 1 (3)                             | 1 (4)                                 |         |
| Other  | 6 (16)                            | 1 (4)                                 |         |
| Prefer not to answer                               | 1 (3)                             | 7 (25)                                |         |
| Ethnicity, n (%)                                   |                                   |                                       |         |
| Hispanic or Latinx                                 | 7 (18)                            | 11 (39)                               | 0.09    |
| Device age in years, mean (SD)                     | 3.2 (1.8)                         | 3.4 (1.9)                             | 0.78    |
| Problems experienced while teleconferencing, n (%) |                                   |                                       |         |
| Internet connectivity issues, any                  | 25 (64)                           | 25 (89)                               | 0.02    |
| Daily or weekly                                    | 14 (36)                           | 18 (64)                               | 0.03    |
| Poor lighting                                      | 28 (71)                           | 22 (79)                               | 0.58    |
| Audio problems, any                                | 15 (38)                           | 19 (68)                               | 0.03    |
| Daily or weekly                                    | 9 (23)                            | 14 (50)                               | 0.04    |
| Inability to find a quiet location                 | 18 (46)                           | 16 (57)                               | 0.46    |
| Inability to join a meeting                        | 2 (5)                             | 8 (29)                                | 0.01    |

**Legend:** Abbreviation: SD, standard deviation.

or planned to purchase additional teleconferencing equipment. Specifically, 20 (30%) students reported that they planned to improve their internet connectivity through some capacity in preparation for online residency interviews. Students who planned to purchase additional equipment were willing to spend an average of \$149 (SD: \$214).

Of the 58 students who self-reported their financial status, there was no association between financial status and the proportion of students who reported teleconferencing issues, such as internet connectivity issues ( $P = 0.38$ ) or audio problems ( $P = 0.61$ ) (Table 2). Self-reported financial status was not significantly associated with device age, satisfaction with teleconferencing equipment, or plans to purchase new equipment. Students who identified as financially disadvantaged were willing to spend an average of \$89 on additional equipment compared to \$175 by students who did not identify as financially disadvantaged ( $P=0.08$ ).

Of 67 survey respondents, 39 (58%) were satisfied with the quality of their teleconferencing equipment. Compared with students who were satisfied with their equipment, students who were dissatisfied were significantly more likely to report problems with audio (68% vs. 38%,  $P = 0.03$ ) and internet connectivity (89% vs. 64%,  $P = 0.01$ ). Device age was not associated with satisfaction with teleconferencing equipment (Table 3).

Regarding teleconferencing resources provided by the medical school, 69% of students (46 of 67) reported that a conference room with reliable internet connectivity available for reservation

would be useful for their upcoming interviews. In addition, 33 (49%) felt a standardized virtual background would be useful, and 23 (34%) responded that plug-in webcams would be useful. Few students indicated utility in borrowing plug-in microphones (27%) or laptops (16%) for residency interviews (Table 4).

## Discussion

Audio and internet connectivity problems are frequently experienced by fourth-year medical students during teleconferencing and are associated with decreased satisfaction with teleconferencing equipment. Self-reported financial disadvantage was not significantly associated with experiencing teleconferencing problems or satisfaction with teleconferencing equipment.

In the past year, numerous guidelines have been published to assist medical students in optimizing teleconferencing, yet no studies have reported the prevalence of teleconferencing issues faced by students.<sup>2-5</sup> In this study, we found that nearly half of the students surveyed experienced daily or weekly internet connectivity problems while teleconferencing, and over half experienced challenges finding a quiet location to attend classes. Many students expressed a need to purchase additional equipment or upgrade their internet plans, which emphasized the disruptiveness of the teleconferencing issues they experienced. The high prevalence of teleconferencing issues experienced by medical students underscores the importance of assessing the consequences of poor teleconferencing conditions, such as potentially being disadvantaged during online residency interviews, medical education, or student assessments. A prior

study found that mock job candidates with poor audio-visual quality during online interviews were significantly less likely to be considered hireable.<sup>18</sup> Halting speech and gaze aversion may negatively influence perceptions of performance by lowering impressions of a person's social skill, intelligence, and confidence.<sup>10,19</sup> Combined with the results of prior studies, our results raise concerns that teleconferencing issues are highly prevalent and have the potential to negatively affect high-stakes interactions, such as residency interviews.

As teleconferencing may be a fixture of future education and residency recruitment practices, programs must consider interventions to mitigate the effect of technical problems that will inevitably occur.<sup>20-22</sup> The first is to optimize teleconferencing conditions during interviews and exams. Ballejos et al. (2018) found that when online medical school interviews occurred on-site and admissions staff provided the equipment, admission rates for applicants were not affected by interview modality.<sup>23</sup> Medical schools can also consider providing access to teleconferencing-enabled spaces that have been quality-checked by administrative staff.<sup>24</sup> In our study, 69% of students reported that this resource would be useful for online interviews. Additionally, medical schools and residency programs can employ technology check-ins to identify and address teleconferencing issues in advance.<sup>20,21,25</sup> For interviews, program staff can allocate extra time in scheduling as a buffer to troubleshoot technical issues and provide non-punitive opportunities to reschedule applicant interviews as needed. Finally, programs may have faculty document whether major teleconferencing issues occurred during the assessment, factor this into the overall applicant assessment, and review whether students with teleconferencing issues were rated equitably as a measure of quality control.

Given the potential negative ramifications of suboptimal teleconferencing quality on online assessment and residency applicant outcomes, we investigated whether financial status was associated with experiencing teleconferencing issues. Prior studies have demonstrated that outdated technology and software may contribute to teleconferencing issues.<sup>9,18</sup> As a result, applicants who have the financial means to purchase up-to-date equipment may have an advantage over financially

disadvantaged students during online interviews. However, we found no significant association between self-reported financial status and likelihood of experiencing teleconferencing problems. Furthermore, satisfaction with teleconferencing equipment did not vary by financial status, indicating that the quality of equipment used may be comparable between the two groups. This finding may be influenced by our institution's requirement for all matriculating medical students to have laptop computers that meet minimum technical standards, and by the provision of need-based financial aid to meet this requirement.<sup>26</sup> Among our respondents, mean device age and plans to purchase new equipment did not vary with self-reported financial disadvantage, which is consistent with this policy. Consequently, baseline access to equipment that meet minimum standards may have promoted similar, but mediocre, teleconferencing experiences across student strata.

Furthermore, teleconferencing factors that were not assessed in this study, such as internet speed and household environment, also have the potential to contribute to teleconferencing differences. Residential internet speeds can vary by usage time, household size, and the internet service provider.<sup>27,28</sup> Home internet connections with lower bandwidth may not be able to support the demands of multiple devices and users, resulting in lower speeds.<sup>29</sup> Accordingly, household conditions and internet service factors may have had a greater influence than financial status on the teleconferencing experiences of students in this study. In a future where virtual education and assessment may become the norm rather than the exception, programs and institutions must anticipate factors that may be out of the control of medical students and disrupt the quality of learning and assessment in medical education.

Limitations of this study include a low response rate of 25% and potential response bias as students with more negative teleconferencing experiences may have been more likely to respond. As the survey was conducted at a single institution as a targeted needs assessment of student experiences and resource requirements, the results may not be generalizable across institutions in other regions. Some results in this study may have

**Table 4.** Association between Medical Student Self-Reported Financial Status and Resource Utility for Residency Interviews, UCLA, 2020.

| Resources that would be useful for residency interviews       | All students, No. (%) (N = 67) <sup>a</sup> | Financially disadvantaged, No. (%) (N = 27) | Not financially disadvantaged, No. (%) (N = 31) | P value |
|---|---|---|---|---------|
| Conference room with adequate Wi-Fi available for reservation | 46 (69)                                     | 19 (70)                                     | 20 (65)   | 0.78    |
| Standardized virtual background                               | 33 (49)                                     | 14 (52)                                     | 14 (45)   | 0.79    |
| Plug-in webcam to borrow                                      | 23 (34)                                     | 6 (22)                                      | 11 (36)   | 0.39    |
| Plug-in microphone to borrow                                  | 18 (27)                                     | 7 (26)                                      | 7 (23)  | >0.99   |
| Laptop or tablet to borrow                                    | 11 (16)                                     | 3 (11)                                      | 4 (13)  | >0.99   |

**Legend:** <sup>a</sup> Respondent numbers of all students do not equal the sum of respondent numbers of financially disadvantaged and not financially disadvantaged students as 9 students declined to answer the survey question on financial status.

been statistically significant if provided sufficient analytic power with a larger sample size, including students from multiple institutions. Statistical analyses were not corrected for multiple comparisons thus limiting the reproducibility of the results. In addition, we asked students to self-report financial status, and objective measures of financial status were not included on the survey. Finally, students may perceive or report their experiences differently, and respondents did not provide objective teleconferencing data such as internet speed or cost of their current equipment.

In conclusion, teleconferencing issues due to audio problems and internet connectivity were highly prevalent among medical

students in this study and were negatively associated with user satisfaction. Self-reported financial status was not significantly associated with experiencing teleconferencing issues or satisfaction with existing teleconferencing equipment. As teleconferencing issues will inevitably occur, steps should be taken to minimize and mitigate those problems in the future, in particular for high-stakes assessments such as online residency interviews. The circumstances of this year offer a unique opportunity to explore teleconferencing experiences during assessment, scrutinize the effect of online modalities on the outcomes of assessments, and inform future practices in resident selection processes.

## References

1. The Coalition for Physician Accountability. Final Report and Recommendations for Medical Education Institutions of LCME-Accredited, U.S. Osteopathic, and Non-U.S. Medical School Applicants. Available from: [https://www.aamc.org/system/files/2020-05/covid19\\_Final\\_Recommendations\\_Executive%20Summary\\_Final\\_0511\\_2020.pdf](https://www.aamc.org/system/files/2020-05/covid19_Final_Recommendations_Executive%20Summary_Final_0511_2020.pdf). Last updated May 11, 2020; cited Dec 10, 2020.
2. Association of American Medical Colleges. Virtual Interviews: Tips for Medical School Applicants. Available from: <https://www.aamc.org/media/44841/download>. Last updated May 14, 2020; cited Dec 1, 2020.
3. American Association of Colleges of Osteopathic Medicine. Virtual Interviewing. Available from: <https://www.aacom.org/match/virtual-interviewing>; publication date unavailable; cited Dec 6, 2020.
4. Williams K, Kling JM, Labonte HR, Blair JE. Videoconference Interviewing: Tips for Success. *J Grad Med Educ*. 2015 Sep;7(3):331.
5. Davis MG, Haas MRC, Gottlieb M, House JB, Huang RD, Hopson LR. Zooming In Versus Flying Out: Virtual Residency Interviews in the Era of COVID-19. *AEM Educ Train*. 2020 Jun 27;4(4):443–6.
6. Couch KA, Fairlie RW, Xu H. Early evidence of the impacts of COVID-19 on minority unemployment. *J Public Econ*. 2020 Dec;192:104287.
7. Bamba C, Riordan R, Ford J, Matthews F. The COVID-19 pandemic and health inequalities. *J Epidemiol Community Health*. 2020 Nov;74(11):964–8.
8. Ambrose AJH. Inequities During COVID-19. *Pediatrics*. 2020 Aug;146(2):e20201501.
9. McColl R, Michelotti M. Sorry, could you repeat the question? Exploring video-interview recruitment practice in HRM. *Hum Resour Manag J*. 2019 Aug 21;29(4):637–56.
10. DeGroot T, Gooty J. Can Nonverbal Cues be Used to Make Meaningful Personality Attributions in Employment Interviews? *J Bus Psychol*. 2009 Jun 1;24(2):179–92.
11. Naumann LP, Vazire S, Rentfrow P, Gosling S. Personality Judgments Based on Physical Appearance. *Pers Soc Psychol Bull*. 2009 Dec;35(12):1661–71.
12. Makdisi G, Takeuchi T, Rodriguez J, Rucinski J, Wise L. How We Select Our Residents—A Survey of Selection Criteria in General Surgery Residents. *J Surg Educ*. 2011 Jan 1;68(1):67–72.
13. Nallasamy S, Uhler T, Nallasamy N, Tapino PJ, Volpe NJ. Ophthalmology Resident Selection: Current Trends in Selection Criteria and Improving the Process. *Ophthalmology*. 2010 May 1;117(5):1041–7.
14. Martin M, Salzberg L. Resident characteristics to evaluate during recruitment and interview: a Delphi study. *Educ Prim Care*. 2017 Mar 4;28(2):81–5.
15. Katzung KG, Ankel F, Clark M, Lawson LE, DeBlieux PMC, Cheaito MA, et al. What Do Program Directors Look for in an Applicant? *J Emerg Med*. 2019 May 1;56(5):e95–101.
16. Stephenson-Famy A, Houmar BS, Oberoi S, Manyak A, Chiang S, Kim S. Use of the Interview in Resident Candidate Selection: A Review of the Literature. *J Grad Med Educ*. 2015 Dec;7(4):539.
17. Burkhardt JC. What Can We Learn From Resident Selection Interviews? *J Grad Med Educ*. 2015 Dec;7(4):673–5.
18. Fiechter JL, Fealing C, Gerrard R, Kornell N. Audiovisual quality impacts assessments of job candidates in video interviews: Evidence for an AV quality bias. *Cogn Res Princ Implic*. 2018 Dec 7;3(1):47.
19. Borkenau P, Liebler A. Observable Attributes as Manifestations and Cues of Personality and Intelligence. *J Pers*. 1995 Jan;63(1):1–25.
20. Zaki MM, Nahed BV. Using Virtual Interviews in Residency Selection Beyond COVID-19. *Acad Med*. 2020 Nov;95(11):e7–8.
21. Vining CC, Eng OS, Hogg ME, Schuivevoerder D, Silverman RS, Yao KA, et al. Virtual Surgical Fellowship Recruitment During COVID-19 and Its Implications for Resident/Fellow Recruitment in the Future. *Ann Surg Oncol*. 2020 May; 18:1–5.
22. Wolff M, Burrows H. Planning for Virtual Interviews: Residency Recruitment During a Pandemic. *Acad Pediatr*. 2021 Jan-Feb;21(1):24–31.
23. Ballejos MP, Oglesbee S, Hetteema J, Sapien R. An equivalence study of interview platform: Does videoconference technology impact medical school acceptance rates of different groups? *Adv in Health Sci Educ*. 2018 Aug 1;23(3):601–10.
24. Nwora C, Allred DB, Verduzco-Gutierrez M. Mitigating Bias in Virtual Interviews for Applicants Who are Underrepresented in Medicine. *J Natl Med Assoc*. 2021 Feb;113(1):74–6.
25. Hagedorn JCI, Chen J, Weiss WM, Fredrickson SW, Faillace JJ. Interviewing in the Wake of COVID-19: How Orthopaedic Residencies, Fellowships, and Applicants Should Prepare for Virtual Interviews. *J Am Acad Orthop Surg*. 2021 Apr 1;29(7):271–7.
26. UCLA David Geffen School of Medicine. DGSOM Student Computing Standards: Class of 2022. Available from: <https://medschool.ucla.edu/workfiles/site-Current/Resources/Computing/MinComputerClassOf2022.pdf>; publication date unavailable; cited Jan 25, 2021.
27. Hecht J. The bandwidth bottleneck that is throttling the Internet. *Nature News*. 2016;536(7615):139.
28. Highspeedinternet.com. Your Guide to Internet Service During New Coronavirus (COVID-19) Outbreak. Available from: <https://www.highspeedinternet.com/resources/the-consumers-guide-to-internet-speed>; last updated Mar 25, 2020; cited Jan 25, 2021.
29. Lai J, Widmar NO. Revisiting the Digital Divide in the COVID-19 Era. *Appl Econ Perspect Policy*. 2021 Mar;43(1):458–64.

---

**Acknowledgments**

The authors wish to acknowledge Dr. Clarence Braddock III, M.D., M.P.H., the UCLA David Geffen School of Medicine Vice Dean for Education, for his support and contributions to study design.

**Conflict of Interest Statement & Funding**

The Authors have no funding, financial relationships or conflicts of interest to disclose.

**Author Contributions**

Conceptualization, Methodology, Writing – Review and Editing: IAH, YD, AJC, JW, JPW, AT, FC; Writing – Original Draft Preparation: IAH, YD, AJC, JW, JPW, FC; Data Curation, Visualization: IAH, YD, AJC; Project Administration: IAH, YD, AJC, FC; Investigation: IAH, FC; Formal Analysis: IAH; Supervision: JW, JPW, AT, FC.

**Cite as**

Huang IA, Dhindsa Y, Chen AJ, Wu J, Wagner JP, Tillou A, et al. Medical Student Teleconferencing Experiences and Financial Status: A Cross-Sectional Survey. *Int J Med Stud*. 2022 Jan-Mar;10(1):56-62.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](#)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](#)



# Assessing Medical Students' Self-Perceived Preparedness to Care for Gender Diverse Patients: A Survey Study

Kyra L. Bonasia,<sup>1</sup> Allie Morgan,<sup>2</sup> Christina Grace Solomon,<sup>3</sup> Ella A. Damiano.<sup>4</sup>

## Abstract

**Background:** Many transgender patients report avoiding healthcare due to discrimination, lack of provider knowledge, and perceived lower quality of care related to their gender identity. One factor contributing to these disparities may be a lack of preparation in medical school related to gender diversity. **Methods:** This cross-sectional survey study assessed third- and fourth-year medical students' self-perceived preparedness to provide medical care for gender diverse patients, at one medical school in the United States. Mixed methods were used with both quantitative analyses and qualitative analyses using grounded theory. **Results:** 54 of 216 eligible students completed the survey (response rate 25%). 53.7% rated themselves as prepared to take a complete medical history from transgender patients compared to 94.4% for cisgender patients. 51.9% rated themselves as prepared to discuss cervical cancer screening with a transmasculine patient. Only 31.5% rated themselves as prepared to provide inclusive preconception counselling. Concerns included using the wrong language and lacking appropriate medical knowledge. The most cited sources of learning about gender diversity were independent learning and fellow students. Five themes emerged in qualitative analyses, two of which included a request for greater opportunities to practice working with gender diverse patients and longitudinal integration of transgender medicine across the curriculum. **Conclusion:** Medical students who completed this survey rated themselves as less prepared to care for gender diverse patients compared to cisgender patients. Their current knowledge was largely based on learning outside of the medical school curriculum. The respondents highlighted many opportunities for improvement in medical school curricula.

**Key Words:** Undergraduate medical education; Curriculum; Health services for transgender persons (Source: MeSH-NLM).

## Introduction

Many transgender patients report avoiding routine healthcare due to experiences of discrimination, lack of provider knowledge of transgender medicine, and perceived lower quality of care related to their gender identity.<sup>1,2</sup> One manifestation of this is in the field of obstetrics and gynecology, where transgender and gender diverse individuals experience lower rates of cervical cancer screening and report challenges in accessing reproductive healthcare.<sup>1,3-5</sup>

One factor that may contribute to these disparities is the lack of formal training that medical students receive during their preclinical and clinical education.<sup>6,7</sup> A survey of Canadian and American medical school deans found that a median of five hours was dedicated to "lesbian, gay, bisexual, and transgender-related content" throughout the entire four years of medical school, with significant variation in the quantity, content, and perceived quality of this instruction.<sup>6</sup> A recent review found that transgender health content specifically is deficient in medical

school curricula, with barriers to incorporation including "limited curricular time, lack of topic-specific competency among faculty, and underwhelming institutional support".<sup>7</sup>

Although these reports suggest that gender diversity is not covered adequately in medical school curricula, there is a paucity of information specific to gender diversity content in medical school since it is usually grouped together with sexual orientation content. Furthermore, there is little information on the impact that current curricula have on how prepared students feel to care for patients of diverse gender identities. Our aim was to survey medical students at a single institution, with a goal of assessing their self-perceived preparedness to provide medical care for transgender people, the sources of their learning about gender diversity, and their views on the gender diversity content in their medical school's current curriculum

## Methods

The STROBE checklist was used as an instrument of evaluation for

<sup>1</sup> MD, Ph.D. Geisel School of Medicine, Dartmouth College, Hanover, NH, United States.

<sup>2</sup> BA. Geisel School of Medicine, Dartmouth College, Hanover, NH, United States.

<sup>3</sup> MD. Geisel School of Medicine, Dartmouth College, Hanover, NH, United States.

<sup>4</sup> MD. Geisel School of Medicine, Dartmouth College, Hanover; Department of Obstetrics and Gynecology, Dartmouth Hitchcock Medical Center, Lebanon, NH, United States.

**About the Author** Kyra Bonasia graduated with her MD from the Geisel School of Medicine at Dartmouth, class of 2021 (Hanover, USA). She previously completed her PhD in Psychology from the University of Toronto.

### Correspondence:

Kyra L. Bonasia. <https://orcid.org/0000-0002-2972-581X>

Address: Geisel School of Medicine, Dartmouth College, Hanover, NH, USA

Email: [kbona071@uottawa.ca](mailto:kbona071@uottawa.ca)

Editor: Francisco J. Bonilla-Escobar

Student Editors: Johnmark Boachie, Joseph Tonge

Copyeditor: Joseph Tonge

Proofreader: Marcel Chee

Layout Editor: Lina Hemmeda

Submission: Nov 12, 2021

Revisions: Nov 15; Dec 1, 2021

Responses: Nov 15; Jan 14, 2022

Acceptance: Jan 11, 2022

Publication: Jan 18, 2022

Process: Peer-reviewed

this cross-sectional survey study.<sup>8</sup> The survey was conducted at the Geisel School of Medicine at Dartmouth College in Hanover, New Hampshire, USA. The study was approved by the Dartmouth College Committee for the Protection of Human Subjects (#32109). All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee.

Survey recipients included all third- and fourth-year medical students at the Geisel School of Medicine. Students received an invitation to participate in the study via an email that included a link to an anonymous survey administered through REDCap. After clicking on the link to the anonymous survey, participants were provided with a description of the survey, reminded of their right to not answer any or all of the questions, that they could withdraw at any time, and told "Proceeding with the survey will be taken as consent for participation". All responses were collected from July 22 to July 31, 2020.

The survey (*Supplementary Material*) included three respondent demographic questions, five questions with Likert scale responses, one multiple choice question, and two free-text short answers. The questions included five clinical scenarios which asked respondents to rate their level of preparation for each encounter type on a Likert scale from "1 = not prepared at all" to "5 = completely prepared and confident". The one multiple-choice question asked respondents to cite their sources of learning about gender medicine including pre-clinical education, clinical training including clerkships, fellow medical students, independent learning, or none if they felt they did not learn about gender diversity. Respondents were able to select more than one answer in this category. The free-text questions asked for thoughts on the current curriculum and recommendations for future changes.

In the analysis, respondents were considered "prepared" if they selected either "4 = prepared but not confident" or "5 = completely prepared and confident." Statistical analyses were

performed using a chi-squared test with statistical significance set at 0.05 and a relative risk (RR) calculation with a confidence interval of 95% (95% CI). Descriptive statistics were reported as counts and percentages.

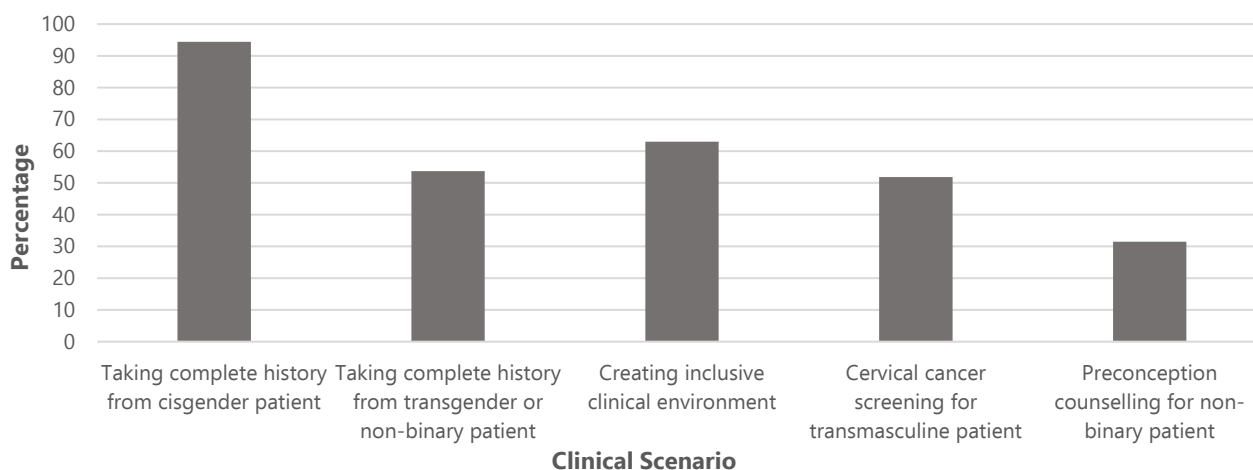
Grounded theory was used to analyze qualitative responses.<sup>9</sup> The coding was performed using an open technique and in an iterative fashion with constant comparison to identify similarities and differences. Two researchers (ED and KB) independently coded the responses including assignment of themes. All disagreements were settled by consensus.

## Results

The survey was completed by 54 out of 216 of eligible students (response rate 25%). Respondents were 37% (n=20) third-year and 63% (n=34) fourth-year students. The respondents' gender identities were 90.7% (n=49) cisgender; 3.7% (n=2) gender diverse including transgender and non-binary; and 5.6% (n=3) preferred not to answer. The respondents' self-reported sexual orientations were 63.0% (n=34) heterosexual; 31.5% (n=17) non-heterosexual including gay, lesbian, bisexual, pansexual, or queer; and 5.6% (n=3) preferred not to answer.

Of the respondents, 53.7% rated themselves as prepared to take a complete medical history from a transgender or non-binary patient compared to 94.4% for a cisgender patient, with a significant difference in self-rated preparedness based on patient gender-category  $\chi^2(1,54) = 23.34, p < .001$ . Respondents were 1.8 times more likely to rate themselves as prepared to take a complete medical history from a cisgender patient compared to a transgender patient (RR=1.8, 95% CI 1.4-2.3). 51.9% of respondents rated themselves as prepared to discuss cervical cancer screening with a transmasculine patient. Only 31.5% of respondents rated themselves as prepared to provide inclusive preconception counseling to a non-binary patient on testosterone. 63.0% of respondents (n=34) felt prepared to create a gender inclusive clinical environment (*Figure 1*).

**Figure 1.** Percentage of medical students who rate themselves as "prepared" to care for patients in various clinical scenarios.





With respect to learning about transgender medicine, 90.7% of respondents (n=49) selected "independent learning" as one of the sources from which they learned the most about gender diversity, making it the most cited source of learning. The second most cited source of learning was "fellow medical students", selected by 83.3% (n=45) of respondents. The preclinical curriculum was cited as a source of learning by 42.6% (n=23) of respondents. All clerkships combined were cited 18 times, with Obstetrics and Gynecology selected most often, by 11.1% (n=6) of respondents.

For the free-text responses, five major themes were identified. These included: (1) lack of prioritizing gender diversity content or incorporating it into the official curriculum, (2) recommendations for increased opportunities to practice clinical interactions with gender diverse patients, (3) lack of transgender medicine knowledge of educators, (4) expressions of the importance of this content, and (5) appreciation for direct interactions with gender diverse patients.

Examples demonstrating lack of prioritizing gender diversity content include, "I don't think I ever heard a faculty really acknowledge the importance of recognizing gender diversity as a natural part of Ob/Gyn [or] preventive health care" and "this is one of those topics that USMLE doesn't emphasize." Another respondent stated, "There was one lecture...and that was it, instead of being integrated into the curriculum ensuring repeated exposure as it should be."

Suggestions for improvement in the curriculum include, "I'd love to see it integrated more thoroughly into the curriculum both preclinical and clinical" and "test questions where the patient is gender non-conforming and they have a knee problem (or something else irrelevant). I'd love to see it as just another patient identifier so as to normalize gender non-conforming people existing."

Many respondents expressed a desire for more opportunities to integrate practice with gender diverse patients across the curriculum. "More case-based learning would be very helpful", stated one respondent. Objective structured clinical examinations (OSCEs) were mentioned frequently as an opportunity to integrate interactions with gender diverse patients during preclinical training. For example, respondents wrote, "we should have an OSCE where we work with a patient who is transgender or gender diverse" and "I would really appreciate simulations with standardized patients where we get to practice interviewing a patient whose gender identity does not correspond to their sex assigned at birth." Another respondent stated, "I think it would be helpful to practice using [pronouns], maybe with question stems or role playing."

Multiple respondents commented that their teaching faculty did not seem comfortable with transgender medicine. For example, one respondent stated, "I think many [faculty] are still

uncomfortable regarding gender diversity due to not feeling like they know enough or it just being a 'foreign' topic to them." Another respondent stated that the longitudinal clinical skills course "would also be a fantastic opportunity to bring... facilitators up to speed (no excuse to say they just 'don't know' when they are required to cover this material with students)."

With respect to the importance of this content, a respondent wrote that the institution "should be more proactive in teaching students about gender diversity because without it, there is a risk of perpetuating negative stereotypes and false beliefs." Other respondents stated, "I do not think I have the appropriate knowledge and skill to help [gender diverse people] in the health issues they face" and "If we really want to be training medical professionals [to be] fully competent in basic medical care, we need to take the time to understand how gender diversity...affects every medical field."

Respondents who were able to learn directly from transgender patients commented on it being a valuable experience. One respondent shared "I greatly appreciated being able to spend some time in an Ob/Gyn transgender medicine clinic." A preclinical panel with transgender people was also brought up frequently, for example: "the panel members were incredible speakers and their stories were important" and "having guest speakers who discussed their experiences being trans was a great privilege."

## Discussion

In this cross-sectional survey of third- and fourth-year medical students, respondents identified that they felt less prepared to care for gender diverse patients when compared to cisgender patients. Respondents felt least prepared to provide preconception counseling, while a slight majority felt prepared to create an inclusive clinical environment and to discuss cervical cancer screening. These rates of preparedness are lower than would be expected for students in their final years of undergraduate medical education. The difference in preparedness with respect to obtaining an inclusive history is particularly notable since this is a fundamental skill in clinical education. A lack of comfort with this skill may further perpetuate inequalities in care for gender diverse people.

In the free response, concerns included using the wrong language and lacking appropriate medical knowledge. Respondents voiced concern that their faculty were not knowledgeable in this field of medicine. This lack of faculty knowledge represents a major challenge to educating the next generation of physicians and could be improved with focused continuing medical education.

Based on these survey results, three recommendations can be made to improve undergraduate medical student curricula. First, curricula can incorporate more practice interacting with gender diverse standardized patients including eliciting and using appropriate pronouns and anatomical language, creating an

inclusive clinical space, and obtaining an inclusive sexual and reproductive history. Next, gender diversity topics can be integrated longitudinally across pre-clinical blocks. Lastly, testing should normalize gender diverse patients in questions and simulated patient encounters. These recommendations are consistent with evidence that integrating didactic sessions and standardized patient encounters related to lesbian, gay, bisexual, and transgender patients can improve clinical competency in undergraduate medical students.<sup>10</sup>

Of note, there are institutions which have made substantial advances in integrating this content into their curricula. For example, some institutions include introductory courses on gender identity and sexual orientation, and electives that focus on endocrine care for transgender patients.<sup>11,12</sup> These institutions may serve as role models for others in the pursuit of providing excellent LGBTQ+ training to pre-clinical and clinical students. The American Medical Association also offers free CME hours related to sexual and gender minorities which could be useful for academic faculty and students alike.<sup>13</sup>

A strength of this study was that it directly surveyed students who had completed the pre-clinical curriculum, with many respondents having completed their core clinical clerkships as well. Another strength of the study is that open-ended qualitative responses were obtained, providing a window into student experiences and views. A limitation of this study was that it

reports self-perceived preparedness, which may not correlate with students' objective performance in patient care. Additionally, this was a convenience sample with a lower response rate, therefore there may be selection bias in the respondents who chose to participate.

This study is also limited in that it only reflects experiences from one institution. These results, however, are consistent with other studies that identified a lack of transgender content across other medical school curricula in North America, suggesting that these findings may be generalizable to other American institutions.<sup>6,7</sup> Additional research is necessary to assess preparation of medical students in transgender medicine both nationally and internationally.

In conclusion, many medical students in their third and fourth years of training rate themselves as less prepared to care for transgender patients compared to cisgender patients, with most of their learning about gender diversity coming from independent learning or fellow medical students rather than the official medical school curriculum. This perceived lack of preparation may negatively impact our next generation of physicians in their care for gender diverse people. This study may help institutions examine their medical school curricula and make improvements to foster an inclusive and effective training environment with respect to gender medicine.

## References

1. James S, Herman JL, Rankin S, Keisling M, Mottet L, Anafi M. The report of the 2015 U.S. Transgender Survey. 2016. Washington DC: National Center for Transgender Equality.
2. Liszewski W, Peebles JK, Yeung H, Arron S. Persons of Nonbinary Gender - Awareness, Visibility, and Health Disparities. *N Engl J Med*. 2018;379(25):2391-2393.
3. Light AD, Obedin-Maliver J, Sevelius JM, Kerns JL. Transgender men who experienced pregnancy after female-to-male gender transitioning. *Obstet Gynecol*. 2014;124(6):1120-1127.
4. Peitzmeier SM, Bernstein IM, McDowell MJ, Pardee DJ, Agenor M, Alizaga NM, et al. Enacting power and constructing gender in cervical cancer screening encounters between transmasculine patients and health care providers. *Cult Health Sex*. 2020;22(12):1315-1332.
5. Stewart T, Lee YA, Damiano EA. Do Transgender and Gender Diverse Individuals Receive Adequate Gynecologic Care? An Analysis of a Rural Academic Center. *Transgend Health*. 2020;5(1):50-58.
6. Obedin-Maliver J, Goldsmith ES, Stewart L, White W, Tran E, Brenman S, et al. Lesbian, Gay, Bisexual, and Transgender-Related Content in Undergraduate Medical Education. *JAMA*. 2011;306(9):971-977.
7. Dubin SN, Nolan IT, Streed CG, Greene RE, Radix AE, Morrison SD. Transgender health care: improving medical students' and residents' training and awareness. *Adv Med Educ Pract*. 2018;9:377-391.
8. Gharaibeh A, Koppikar S, Bonilla-Escobar FJ. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) in the International Journal of Medical Students. *Int J Med Stud*. 2014;2(2):36-37.
9. Glaser B, Strauss A. *The discovery of grounded theory; strategies for qualitative research*. Chicago: Aldine Pub. Co. 1967.
10. Sequeira GM, Chakraborti C, Panunti BA. Integrating Lesbian, Gay, Bisexual, and Transgender (LGBT) Content Into Undergraduate Medical School Curricula: A Qualitative Study. *Ochsner J*. 2012;12(4):379-382.
11. "LGBTQ+ Curriculum" University of Maryland School of Medicine. <https://www.medschool.umaryland.edu/LGBTQ-Resources/>. Accessed December 14, 2021.
12. University of Pittsburgh School of Medicine. "Diversity, Equity, & Inclusions Mini Electives". Available from: <https://meddiversity.pitt.edu/diversity-mini-electives>. Cited December 14, 2021.
13. AMA Ed Hub. "LGBTQ Health, Diversity & Inclusion". Available from: <https://edhub.ama-assn.org/course/265>. Cited December 14, 2021.

---

**Acknowledgments**

The authors gratefully acknowledge Paul Hanissian MD for his comments on a draft of this manuscript.

**Conflict of Interest Statement & Funding**

The Authors have no funding, financial relationships or conflicts of interest to disclose.

**Author Contributions**

Conceptualization, Data Curation, Methodology, Project Administration, Resources, Validation, Visualization, Writing – Review & Editing: KLB, AM, GCS, EAD. Investigation: KLB, AM, GCS. Supervision: EAD. Formal Analysis, Writing – Original Draft Preparation: KLB & EAD.

**Cite as**

Bonasia, KL, Morgan A, Solomon GC, Damiano EA. Assessing Medical Students' Self-Perceived Preparedness to Care for Gender Diverse Patients: A Survey Study. Int J Med Stud. 2022 Jan-Mar;10(1):63-68.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](#)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](#)



## Supplementary Material

*Survey to Assess Medical Students' Self-Perceived Preparedness to Care for Gender Diverse Patient.*

**As a reminder, all information in this survey is anonymous, all questions are optional, and you are free to withdraw from the survey at any time before submission without your answers being recorded (simply exit the survey window). This survey should take 10 minutes or less.**

|  |   |  |                     |                              |                                     |
|--|---|--|---------------------|------------------------------|-------------------------------------|
| 1. Which of the following best describes your year / clerkship experience in medical school?   | <input type="checkbox"/> M3 have not completed OB/Gyn clerkship<br><input type="checkbox"/> M3 have completed OB/Gyn clerkship<br><input type="checkbox"/> M4 have not completed OB/Gyn clerkship<br><input type="checkbox"/> M4 have completed OB/Gyn clerkship  |  |                     |                              |                                     |
| 2. How prepared do you feel to take a complete medical history (a history you might take at a general new patient visit) from a patient whose gender identity corresponds to their sex assigned at birth?  | 1=not prepared at all   | 2=mostly unprepared, some idea of where to start | 3=somewhat prepared | 4=prepared but not confident | 5=completely prepared and confident |
| 3. How prepared do you feel to take a complete medical history from a patient whose gender identity does not correspond to their sex assigned at birth (for example gender non-binary, gender-queer, transgender)?   | 1=not prepared at all   | 2=mostly unprepared, some idea of where to start | 3=somewhat prepared | 4=prepared but not confident | 5=completely prepared and confident |
| 4. How prepared do you feel to create an inclusive clinical environment for patients of any gender identity (for example, working with others to ensure clinic space is inclusive, asking for and using preferred names and pronouns, using gender-neutral language during a medical interview)? | 1=not prepared at all   | 2=mostly unprepared, some idea of where to start | 3=somewhat prepared | 4=prepared but not confident | 5=completely prepared and confident |
| 5. From what sources do you feel you learned the most with respect to gender diversity? (Select all that apply.)   | <input type="checkbox"/> Independent learning outside of medical school<br><input type="checkbox"/> Learning from fellow medical students<br><input type="checkbox"/> Teaching within the official preclinical curriculum<br><input type="checkbox"/> Materials encountered during the Internal Medicine clerkship<br><input type="checkbox"/> Materials encountered during the Surgery clerkship<br><input type="checkbox"/> Materials encountered during the Pediatrics clerkship<br><input type="checkbox"/> Materials encountered during the OB/Gyn clerkship<br><input type="checkbox"/> Materials encountered during the Family Medicine clerkship<br><input type="checkbox"/> Materials encountered during the Psychiatry clerkship<br><input type="checkbox"/> Other. Where: _____<br><input type="checkbox"/> None, I did not learn about this |  |                     |                              |                                     |

**The following are meant as general scenarios that one might encounter as a medical student, to assess how prepared you feel to provide inclusive care for patients who identify with a gender different from their sex assigned at birth.**

|   |  |  |                     |                              |                                     |
|---|--|--|---------------------|------------------------------|-------------------------------------|
| 6. You are a medical student meeting a new patient. He is a 27-year-old transgender male receiving testosterone therapy who just moved to the area. As part of the visit you will be taking a history and recommending relevant screening and vaccinations. You notice from reading his records that he is listed as "overdue for cervical cancer screening. On a scale of 1-5, how prepared do you feel to take an appropriate history and to make recommendations regarding screening and vaccinations? | 1=not prepared at all  | 2=mostly unprepared, some idea of where to start | 3=somewhat prepared | 4=prepared but not confident | 5=completely prepared and confident |
| 7. You are a medical student scheduled to see a 30-year-old gender non-binary patient on testosterone. You see from reading back through the medical record that they had been considering pregnancy when they were last seen for a visit 6 months ago. On a scale of 1-5, how prepared do you feel to provide inclusive preconception care for this patient?   | 1=not prepared at all  | 2=mostly unprepared, some idea of where to start | 3=somewhat prepared | 4=prepared but not confident | 5=completely prepared and confident |
| 8. If you would like to share any other thoughts or perceptions regarding education about gender diversity at Geisel, please do so here:  | _____  |  |                     |                              |                                     |
| 9. If you have any recommendations regarding what you would like to see in medical education about gender diversity, please share them here:  | _____  |  |                     |                              |                                     |
| 10. If you are comfortable doing so, please select the category of gender identity that most closely aligns with your gender.   | <input type="checkbox"/> Cisgender <input type="checkbox"/> Transgender <input type="checkbox"/> Non-binary <input type="checkbox"/> Gender-queer <input type="checkbox"/> Other, which: _____ <input type="checkbox"/> Prefer not to answer   |  |                     |                              |                                     |
| 11. If you are comfortable doing so, please share how you would describe your sexual orientation.   | <input type="checkbox"/> Heterosexual/straight <input type="checkbox"/> Bisexual <input type="checkbox"/> Pansexual <input type="checkbox"/> Gay <input type="checkbox"/> Lesbian <input type="checkbox"/> Queer <input type="checkbox"/> Asexual <input type="checkbox"/> Other, which: _____ <input type="checkbox"/> Prefer not to answer |  |                     |                              |                                     |

# Rationalizing the Pediatric Emergency Department Workload: An Epidemiological Profile of Presentations Before and During the COVID-19 Pandemic

Hannah Farley,<sup>1</sup> Helen Bennett,<sup>2</sup> Sahana Rao.<sup>3</sup>

## Abstract

**Background:** Infectious respiratory disease in children provides a significant seasonal workload burden to pediatric emergency departments. Studies from the southern hemisphere during the first wave of coronavirus (COVID-19) had shown a decrease in seasonal pediatric respiratory infections. During the COVID-19 pandemic, predicted drops in infectious diseases circulating in children led to redeployment of junior doctors in pediatric services to adult services. **Methods:** We extracted data on children presenting to a tertiary emergency department with a respiratory illness, comparing winter 2019-2020 (pre-COVID-19) to winter 2020-2021 (during-COVID-19). We compiled demographic and epidemiological data and compared the two groups with regards to number and type of infectious respiratory presentations, admissions, days spent in hospital, and whether intensive or high-dependency support was required. **Results:** We have found a reduction in respiratory disease presentations during-COVID-19 compared to pre-COVID-19. These patients were more likely to be admitted but their stay was reduced, and there was a trend towards a reduction in requirement for intensive or high-dependency support during their admission. **Conclusion:** This work supports the redeployment of junior doctors in pediatric departments to adult departments given increased demand in other areas of medical care at that time. In view of the changing landscape, we suggest the introduction of a flexible staffing format to ensure adequate support to areas with higher demand.

**Key Words:** COVID-19; Workforce; Workload; Communicable Diseases; Respiratory Tract Diseases (Source: MeSH-NLM).

## Introduction

On Wednesday 11<sup>th</sup> March 2020, the World Health Organization declared a global pandemic of coronavirus (COVID-19),<sup>1</sup> resulting in large-scale changes in behavior in the United Kingdom and globally. Decrease in attendance at pediatric emergency departments (PED) occurring in line with social distancing and stay-at-home orders has been well documented,<sup>2-4</sup> and is thought to be due to a reduction in other transmissible infections. Typically, winter is the busiest time of year for pediatric departments, with an increase in children and young people (CYP) presenting with communicable respiratory disease such as croup, bronchiolitis and viral-induced wheeze (VIW).<sup>5-7</sup> However, the changes in behavior caused by stay-at-home restrictions were thought to have led to a reduction in the incidence of typical seasonal infections, which particularly affect CYP.

As such, prior to an anticipated increase in COVID-19 infections and hospital presentations in winter 2020-2021, experience of decreased pediatric presentations<sup>2-4</sup> associated with peaks of COVID-19 infection meant that junior doctors (particularly

foundation and early specialty trainees) on pediatric rotations in the UK were amongst the lowest priority groups to remain on scheduled rotations, and amongst the first to be re-deployed to help with the anticipated increase in COVID-positive adult patients.<sup>8</sup>

In this study, we characterize the changes in population attending the PED of a tertiary-level pediatric hospital in the UK for respiratory complaints between the 2019-2020 and 2020-2021 winters, as well as an overview of the resultant clinical workload in terms of admissions and treatment escalation to the pediatric intensive care unit (PICU). We aim to provide information in order to further rationalize the redeployment of junior medical personnel in future pandemic situations whilst ensuring adequate staffing is maintained for the care of CYP.

## Methods

We analyzed respiratory disease presenting to the PED of a tertiary hospital in November-February of 2019-2020 (henceforth referred to as winter pre-COVID-19) and November-February

<sup>1</sup> BAMEDSci, DPhil. Oxford University Medical School, Medical Sciences Divisional Office, University of Oxford, Level 3, John Radcliffe Hospital, Oxford, United Kingdom.

<sup>2</sup> BAMEDSci. Oxford University Medical School, Medical Sciences Divisional Office, University of Oxford, Level 3, John Radcliffe Hospital, Oxford, United Kingdom.

<sup>3</sup> FRCPCH, DCH, PGCME, MCADMED. John Radcliffe Hospital, Paediatrics Department, Oxford University Hospitals NHS Trust, Department of Paediatrics, Headley Way, Dept of Paediatrics, University of Oxford, Medical Sciences Divisional Office, University of Oxford, Level 3, John Radcliffe Hospital, Oxford, United Kingdom.

**About the Author:** Hannah Farley is currently a 6th year medical student of Oxford University (Oxford, UK) of a 6 year program.

### Correspondence:

Hannah Farley. <https://orcid.org/0000-0001-5383-1367>

Address: Headley Way, Headington, Oxford OX3 9DU, United Kingdom

Email: [hannah.farley@univ.ox.ac.uk](mailto:hannah.farley@univ.ox.ac.uk)

Editor: Francisco J. Bonilla-Escobar

Student Editors: Adnan Mujanovic, Diego Carrion Alvarez

Copyeditor: Marina Shatskikh

Proofreader: Adam Dinoff

Layout Editor: Francisco J. Bonilla-Escobar

Submission: Sep 6, 2021

Revisions: Sep 29; Nov 28, 2021

Responses: Oct 14; Dec 21, 2021

Acceptance: Jan 16, 2022

Publication: Jan 24, 2022

Process: Peer-reviewed

2020-2021 (henceforth referred to as winter during-COVID-19). We manually searched these records and included patients with clinical respiratory diagnoses on their discharge summaries of likely infectious etiology (bronchiolitis, croup, viral-induced wheeze, upper respiratory tract infection, lower respiratory tract infection and asthma exacerbation). We excluded patients with uncertain diagnoses, non-respiratory pathology and non-communicable causes of respiratory pathology (for example, foreign body inhalation and panic attacks). The STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) checklist<sup>9</sup> was used to ensure study quality.

Analysis of respiratory presentations was conducted within Prism. Respiratory presentations were assessed as a proportion of total presentations to the PED and will be presented as % (n, males) unless specified otherwise. A Fisher's exact test was used to analyze whether there was a significant relationship between either presentations or admissions and the year. The effect of these relationships was estimated using an odds ratio. Results are presented with 95% confidence intervals (95% CI).

Analysis of demographic changes was conducted in Microsoft Excel using paired T-test analysis assuming unequal variance (age) and two sample Z test analysis (proportion of respiratory admissions where the patient had previously required high dependency unit (HDU)/ICU care).

## Results

There was a 45.9% decrease in presentations to the PED, with the total number of presentations during winter pre-COVID-19 being 7,789 and 4,210 presentations during during-COVID-19 (**Table 1**). Of these presentations, 21.4% (n=1,666, m=1,003) were due to respiratory illness in winter pre-COVID-19 and 7.0% (n=296, m=196) were due to respiratory illness in winter during-COVID. Presentations are presented by discharge diagnosis in **Table 2**. Children presenting during-COVID-19 were significantly less

likely to have a respiratory illness than those pre-COVID-19 (95% CI 0.24-0.32,  $p < 0.0001$ ). We analyzed the clinical need of respiratory presentations by looking at number of admissions, duration of stay, and requirement for escalation to pediatric intensive care unit (PICU). Pre-COVID-19, 34.1% of presentations of respiratory illness (n=568) led to admission with a mean duration of stay of 2.14 nights (**Table 1**). During-COVID-19, although the number of admissions decreased to 164, the proportion requiring admission increased to 55.4% (**Table 1**). This relationship was statistically significant with patients presenting during during-COVID-19 being 2.4 times more likely to be admitted (95% CI 1.87-3.08,  $p < 0.0001$ , **Table 3**).

During-COVID-19, the mean duration of stay decreased to 1.62 nights, and the proportion requiring escalation to intensive care unit (ICU) decreased from 5.1% of respiratory admissions pre-COVID-19 to 3.0% of respiratory admissions during-COVID-19.

We also analyzed patients attending the PED due to respiratory illness in terms of age and prior requirement for HDU/ICU care for a respiratory complaint. We found that there was no significant change ( $p=0.178$ ) in terms of mean age at presentation (pre-COVID-19 = 2.56 years; during-COVID-19 = 2.82 years). In terms of prior HDU/ICU care for a respiratory complaint, 4.1% of patients pre-COVID-19 had received this care (n = 68), whilst during-COVID-19 5.4% of CYP attending for a respiratory illness had previously required HDU/ICU support (n = 16). This was not a statistically significant difference ( $p=0.43$ ).

## Discussion

Our data show a significant decrease in presentations at a PED during winter 2020-2021 compared to winter 2019-2020. There was a reduction in the number of children attending the PED, and a lower proportion attending with a respiratory illness. The winter of 2020-2021 occurred after the onset of the COVID-19 pandemic

**Table 1.** Respiratory Presentations to the Emergency Department (ED) Pre-COVID-19 and During-COVID-19.

| Month    | Year | All ED Presentations (n) | Infectious respiratory presentations (% of total presentations) | Respiratory presentations leading to admission (%) | Mean length of admission (days) |
|----------|------|--------------------------|---|--|---------------------------------|
| Total    | 2019 | 7789                     | 1666 (21.4)   | 568 (34.1)   | 2.14                            |
|          | 2020 | 4210                     | 296 (7)   | 164 (55.4)   | 1.62                            |
| November | 2019 | 2140                     | 456 (21.3)  | 128 (28.1)   | 1.90                            |
|          | 2020 | 1287                     | 123 (9.6)   | 89 (72.4)  | 1.59                            |
| December | 2019 | 2189                     | 589 (26.9)  | 192 (32.6)   | 2.29                            |
|          | 2020 | 1103                     | 86 (7.8)  | 50 (58.1)  | 1.62                            |
| January  | 2020 | 1772                     | 343 (19.4)  | 136 (39.7)   | 2.17                            |
|          | 2021 | 886                      | 36 (4.1)  | 13 (36.1)  | 1.85                            |
| February | 2020 | 1688                     | 278 (16.5)  | 112 (40.3)   | 2.14                            |
|          | 2021 | 934                      | 51 (5.5)  | 12 (23.5)  | 1.50                            |

**Table 2.** Demographics of Children and Young People Presenting to ED with Respiratory Illness.

| Season | Diagnosis                                | Number of admissions (%) | Mean Age |       | Sex (n) |        |
|--------|--|--------------------------|----------|-------|---------|--------|
|        |  |                          | Months   | Years | Male    | Female |
| 19/20  | Total                                    | 1666                     | 30.76    | 2.56  | 1003    | 663    |
|        | Asthma Exacerbations                     | 51 (3.1)                 | 117.04   | 9.75  | 30      | 21     |
|        | Bronchiolitis                            | 416 (25.0)               | 5.62     | 0.47  | 259     | 157    |
|        | Croup                                    | 222 (13.3)               | 34.74    | 2.90  | 145     | 77     |
|        | Lower respiratory tract infection (LRTI) | 211 (12.7)               | 45.03    | 3.75  | 112     | 99     |
|        | Upper respiratory tract infection (URTI) | 436 (26.2)               | 34.35    | 2.86  | 249     | 187    |
|        | Viral induced wheeze (VIW)               | 300 (18.0)               | 32.40    | 2.70  | 188     | 112    |
|        | Other                                    | 30 (1.8)                 | 48.60    | 4.05  | 9       | 2      |
| 20/21  | Total                                    | 296                      | 33.84    | 2.82  | 196     | 100    |
|        | Asthma Exacerbations                     | 16 (5.4)                 | 130.34   | 10.86 | 8       | 8      |
|        | Bronchiolitis                            | 28 (9.5)                 | 7.14     | 0.60  | 19      | 9      |
|        | Croup                                    | 23 (7.8)                 | 23.15    | 1.93  | 16      | 7      |
|        | Lower respiratory tract infection (LRTI) | 10 (3.4)                 | 25.38    | 2.12  | 7       | 3      |
|        | Upper respiratory tract infection (URTI) | 71 (24.0)                | 15.82    | 1.32  | 50      | 21     |
|        | Viral induced wheeze (VIW)               | 137 (46.3)               | 36.13    | 3.01  | 88      | 49     |
|        | Other                                    | 11 (3.7)                 | 98.10    | 8.18  | 5       | 3      |

in March 2020, and during the second wave of COVID-19 infections and resulting hospitalizations in the UK adult population. This reduction in presentations reflects recent data from Brueggeman et al,<sup>10</sup> demonstrating that in the adult population, non-COVID-19 transmissible bacterial disease dramatically decreased in the face of social distancing and increased hygiene measures. During this period, junior doctors were redeployed from pediatric to adult wards to assist with the care of COVID-positive patients.

One caveat to this support for reduction in pediatric staffing would be that a greater proportion of respiratory presentations at PEDs did require admission. Although there were a much smaller number of admissions compared to the previous (pre-COVID) winter, we suggest that this underlines the need to maintain senior staff support on pediatric wards to provide quality care for those CYP requiring admission. Flexible staff redeployment must also be a possibility given that the summer of 2021 has seen an increased demand for pediatric services and

EDs, with a significant burden of disease that is typically considered to be winter seasonal disease, for example viral-induced wheeze.<sup>11, 12</sup>

A limitation of this study would be that it only reviews the patient profile at one tertiary-level ED; COVID-19 prevalence levels did vary between regions, leading to regional changes in social restrictions which could impact patient presentation at EDs. However, by the start of this study restrictions were in place on a national as opposed to local basis. Restrictions also varied by country, which emphasizes the need for research from multiple healthcare providers internationally to enable a comprehensive evaluation of changes in presentation behavior associated with COVID-19.

Another limitation of this study is that it does not completely provide an overview of why there was a reduction in presentations. Were the same number of children ill, but parents/caregivers were less likely to bring children to ED given

**Table 3.** Statistical Analysis Comparing Winter Pre-COVID-19 (November 2019 – February 2020) and During-COVID-19.

| Period   | Analysis of infectious respiratory presentations<br>p-value (95% CI) | Analysis of respiratory presentations leading to admission<br>p-value (95% CI) |
|----------|--|--|
| Total    | p < 0.0001 (0.24-0.32)   | p < 0.0001 (1.87-3.08)   |
| November | p < 0.0001 (0.32-0.48)   | p < 0.0001 (4.32-10.42)  |
| December | p < 0.0001 (0.18-0.29)   | p < 0.0001 (1.81-4.56)   |
| January  | p < 0.0001 (0.12-0.24)   | p = 0.72 (0.43-1.72)   |
| February | p < 0.0001 (0.22-0.40)   | p = 0.027 (0.24-0.88)  |

**Legend:** A Fisher's exact test was used to analyse whether there was a significant relationship between either presentations or admissions and the year. The effect of these relationships was estimated using an odds ratio. Results are presented with 95% confidence interval.

concerns around COVID-19 transmission in a hospital setting? A piece of our data supporting this would be the increase in the proportion of children presenting who were then admitted, indicating that in the pre-COVID-19 winter there was perhaps a tendency to present to ED more readily, with children being less unwell at presentation. However, this is not then mirrored in the length of stay or an increased requirement for HDU/ICU support in children admitted during-COVID. It is worth considering that medical staff and parents/caregivers may also have been more supportive of earlier discharge given concerns about transmission of COVID in a hospital setting. This would require more qualitative research to elucidate, but we note that by the time of winter during-COVID-19, it was widely accepted that CYP rarely suffered significant consequences from a COVID-19 infection.

A more likely explanation could be that there was overall a reduction in respiratory illness in CYP in the during-COVID-19 due to increased hygiene measures and reduced social contact, with there being less illness overall. This is supported by the recent surge in childhood infectious respiratory illness, particularly respiratory syncytial virus (RSV), in the summer of 2021.<sup>11,12</sup> Our analysis of PED attendances supports the

redistribution of junior medical staff when necessary and suggests that a significant factor underpinning the overall decrease in attendance at PED was the decrease in infectious respiratory disease presentations. We suggest a system of flexible staffing to manage the changing demographic of respiratory presentations during and after the COVID-19 pandemic. Pediatric doctors have been working intensively throughout the pandemic, and we highlight the need to be cautious in redeployment of pediatric junior doctors, so that children are not harmed and continue to receive excellent care.

An area for future research would be exploring the reasons behind a reduction in ED presentation, including comparison of community healthcare consultation frequencies with ED presentations to determine whether anxiety about hospital-related COVID-19 transmission had a role in the reduction in ED presentations seen in this study. In the long-term, research into this area may have the potential to inform care-seeking behavior modification strategies by further understanding drivers for presentation at community- or hospital-based healthcare settings.

## References

- World Health Organization (WHO). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. Available from: <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>; updated 2020 Mar 11; accessed 2021 Aug 12.
- Isba R, Edge R, Jenner R, Broughton E, Francis N, Butler J. Where have all the children gone? Decreases in paediatric emergency department attendances at the start of the COVID-19 pandemic of 2020. *Arch Dis Child*. 2020;105(7):704.
- Shanmugavadeivel D, Liu J, Gilhooley C, Elsaadany L, Wood D. Changing patterns of emergency paediatric presentations during the first wave of COVID-19: learning for the second wave from a UK tertiary emergency department. *BMJ Paediatr Open*. 2021;5(1):e000967.
- Buntsma D, Lithgow A, O'Neill E, Palmer D, Morris P, Acworth J et al. Paediatric Research in Emergency Departments International Collaborative (PREDICT). Patterns of paediatric emergency presentations to a tertiary referral centre in the Northern Territory. *Emerg Med Australas*. 2017;29(6):678-685.
- D'Souza RM, Bambrick HJ, Kjellstrom TE, Kelsall LM, Guest CS, Hanigan I. Seasonal variation in acute hospital admissions and emergency room presentations among children in the Australian Capital Territory. *J Paediatr Child Health*. 2007;43(5):359-65.
- Pattemore PK, Jennings LC. Epidemiology of Respiratory Infections. *Pediatric Respiratory Medicine* 2008; 435-52.
- Goldman RD, Grafstein E, Barclay N, Irvine M, Portales-Casamar E. Paediatric patients seen in 18 emergency departments during the COVID-19 pandemic. *Emerg Med J*. 2020;37:773-777.
- Boodhun N, Jay N, Carzedda D, Rogers M. Prioritising paediatric staff and space so every child has access to care. *Arch Dis Child*. 2021;106(6):622-623.
- Gharaibeh A, Koppikar S, Bonilla-Escobar FJ. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) in the International Journal of Medical Students. *Int J Med Stud*. 2014;2(2):36-37.
- Brueggemann AB, van Rensburg MJJ, Shaw D, McCarthy ND, Jolley KA, Maiden MCJ et al. Changes in the incidence of invasive disease due to *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Neisseria meningitidis* during the COVID-19 pandemic in 26 countries and territories in the Invasive Respiratory Infection Surveillance Initiative: a prospective analysis of surveillance data. *Lancet Digit Health*. 2021 Jun;3(6):e360-e370.
- van Summeren J, Meijer A, Aspelund G, Casalegno JS, Erna G, Hoang U et al. Low levels of respiratory syncytial virus activity in Europe during the 2020/21 season: what can we expect in the coming summer and autumn/winter? *Euro Surveill*. 2021;26(29):2100639. Erratum in: *Euro Surveill*. 2021;26(30).
- Agha R, Avner JR. Delayed seasonal RSV surge observed during the COVID-19 pandemic. *Pediatrics*. 2021;148(3):e2021052089.



---

**Acknowledgments**

None.

**Conflict of Interest Statement & Funding**

The Authors have no funding, financial relationships or conflicts of interest to disclose.

**Author Contributions**

Conceptualization, Methodology: HF, HB, SR. Data Curation, Investigation, Project Administration, Validation, Visualization: HF, HB. Formal Analysis: HB. Resources, Supervision: SR. Writing – Original Draft Preparation: HF. Writing – Review & Editing: HF, SR.

**Cite as**

Farley H, Bennett H, Rao S. Rationalizing the Pediatric Emergency Department Workload: An Epidemiological Profile of Presentations Before and During the COVID-19 Pandemic. *Int J Med Stud*. 2022 Jan-Mar;10(1):69-73.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](#)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](#)



# Childhood Effects of Prenatal and Postnatal Exposure to Mercurial Skin Lightening Agents. Literature Review

Rebecca Murerwa,<sup>1</sup> Fidel Gwala,<sup>2</sup> Thomas Amuti,<sup>2</sup> Mary Muange.<sup>3</sup>

## Abstract

Children's exposure to mercurial skin lightening agents at any time during their development, from intra-uterine to early developmental life, can lead to severe detrimental health effects. This is because these skin lightening agents contain inorganic mercury as their active ingredient at varying concentrations that exceed acceptable levels. Mercury does not confer any physiological benefit to the human body, and as such, it has only been linked to numerous adverse effects on users and may pose a possible health risk for children born to, living with, and in contact with skin bleaching agent users. Although studies have shown that inorganic mercury exposure may be detrimental to children, there is a paucity of data, to the best of our knowledge, on reviews exploring specifically the possible routes of exposure to and effects of mercurial skin lightening agents on children. Since prevention is the only key to reducing mercury poisoning and toxicity, this study aims to extensively review the literature on prenatal and postnatal exposure to mercury in children from cosmetic skin lightening agents and discuss possible detrimental effects.

**Key Words:** Mercury compounds; Inorganic mercury poisoning; Skin lightening preparations; Maternal-fetal exchange; Prenatal exposure delayed effects (Source: MeSH-NLM).

## Introduction

Skin bleaching refers to the process of removing pigment from an individual's skin.<sup>1</sup> It is practiced by both men and women in many countries.<sup>2-6</sup> Skin lightening agents are widely available as they are sold over the counter in pharmacies and supermarkets.<sup>3,7</sup> They are available as gels, creams, and lotions<sup>3</sup> and contain various chemicals, including inorganic mercury compounds.<sup>4,8</sup> Skin lightening effects are reversible once a person stops using topical skin lightening agents.<sup>9</sup> This is because epidermal cells are continuously replaced by new cells capable of melanogenesis.<sup>5,6</sup> Topical application of skin lightening agents is often carried out continuously and over a long period to achieve and maintain the desired effects.<sup>6</sup> Despite the reversibility of the skin lightening effect, some adverse systemic effects of these agents may persist even after their use is stopped due to the accumulation of harmful components in the user's tissues. Inorganic mercury is the active agent found in mercurial skin lightening agents.<sup>10</sup> It replaces copper necessary for tyrosinase enzyme activity, thus inhibiting the synthesis of melanin.<sup>10</sup> Human skin is highly permeable to this form of mercury, absorbing 0.8% to 3.7% of the dose applied.<sup>11</sup> Once absorbed into the bloodstream, inorganic mercury is transported to various organs such as the liver, ovaries, and kidneys of an individual where, after chronic use, it accumulates and can cause tissue injury and organ dysfunction.<sup>6,12</sup>

There is a high prevalence of cosmetic skin lightening among women of reproductive age in African countries with prevalence of 25% in Mali and 30% in Tanzania.<sup>3,4,11</sup> This has been attributed to the influence of

societal portrayal of lighter individuals as beautiful and the perpetuation of this notion by mass media and popular culture in some areas.<sup>8</sup> Furthermore, the use of these agents during pregnancy and lactation has been documented.<sup>13,14</sup> The effects of mercurial skin lightening agents on users have been well documented, including skin, renal, and nervous system damage.<sup>8,15-16</sup> These agents also pose a possible health risk for children born to, living with, and in contact with skin bleaching agent users. This study, therefore, aims to extensively review possible prenatal and postnatal exposure to mercury in children from mercurial skin lightening agents, the possible effects associated with such exposure as well as the possible effects through which these effects are mediated.

## Methods

### Search Strategy

This is a narrative review. Literature was searched using Google Scholar and PubMed. The keywords entered into PubMed and Google Scholar were "cosmetic skin lightening" or "skin lightening preparations" and "foetal toxicity" or "foetal exposure" or "prenatal exposure" or "prenatal toxicity" and "inorganic mercury". "Or" and "and" were the operators used. An additional search of the references of selected articles was carried out, and relevant articles were included.

<sup>1</sup> Medical Student. University of Nairobi. Research in Medicine Kenya (ReMed Kenya), Nairobi, Kenya.

<sup>2</sup> BSc Anatomy. University of Nairobi. Research in Medicine Kenya (ReMed Kenya), Nairobi, Kenya.

<sup>3</sup> MBChB, MMed, Pediatric Consultant. Kangundo Sub-county Hospital, Kangundo Town, Machakos County, Kenya.

**About the Author:** Rebecca Murerwa is a final year medical student at the University of Nairobi, Nairobi, Kenya of a six-year program. She has published research on the morphological variations of the calcaneus in the Kenyan population.

### Correspondence:

Rebecca Murerwa. <https://orcid.org/0000-0003-1405-4520>

Address: University of Nairobi, Kenya.

Email: [rebeccamurerwa@gmail.com](mailto:rebeccamurerwa@gmail.com)

Editor: Francisco J. Bonilla-Escobar

Student editor: Adnan Mujanovic, Benjamin Liu, Abdul Basith K M, Johnmark Boachie, & Joseph Tonge

Copyeditor: Nguyen Tran Minh Duc

Proofreader: Sebastian Diebel

Layout Editor: Lucianne Adhiambo Odiero

Submission: Nov 21, 2020

Revisions: Jan 11; Jul 1; Nov 3, 2021

Responses: Feb 17; Jul 5; Nov 11, 2021

Acceptance: Nov 14, 2021

Publication: Nov 24, 2021

Process: Peer-reviewed

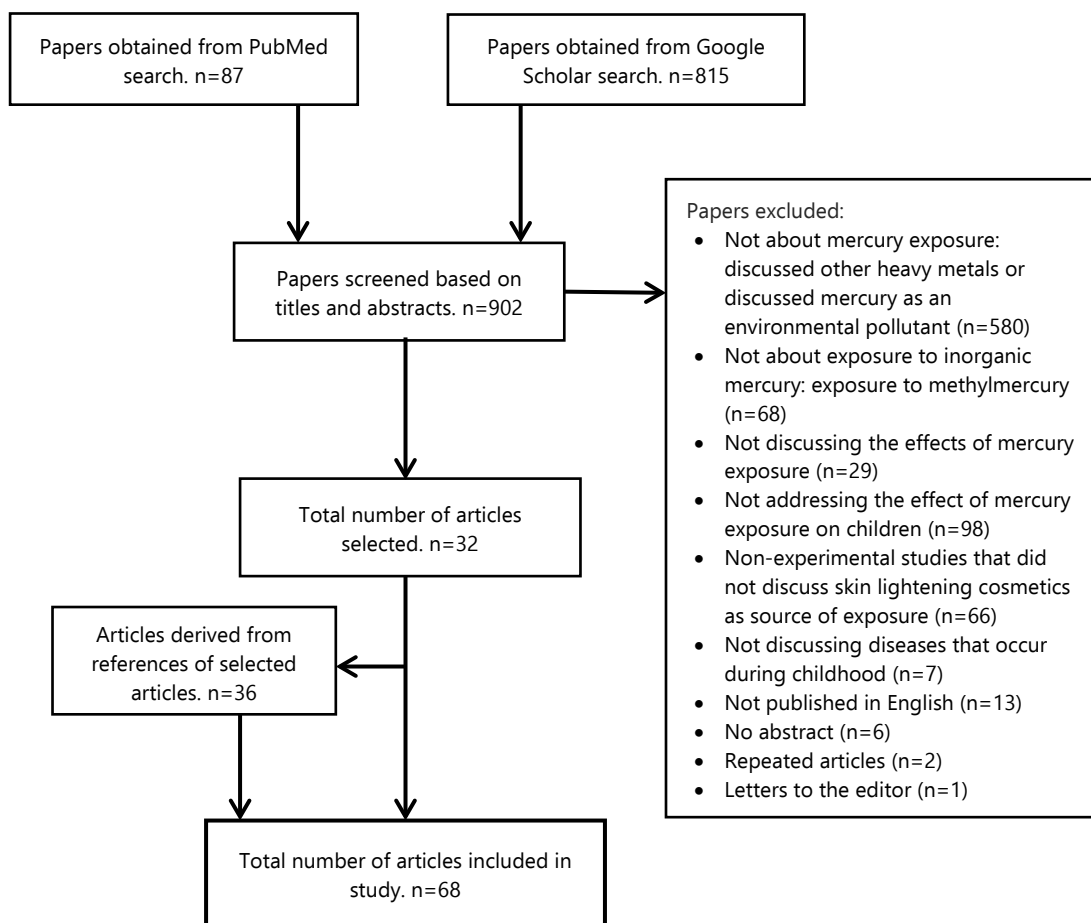
**Selection Criteria**

Papers that did not discuss the effects of prenatal and postnatal exposure to inorganic mercury were excluded after screening the titles, abstracts, and reading full texts. Articles published in English were included. Articles that contained the words "skin lightening preparations" or "skin bleaching" were included. Articles that exclusively discussed the effect of methylmercury and mercury exposure following consumption of fish were excluded. Articles that discussed the concentration of mercury in cosmetics without addressing effects on exposed offspring were excluded. The criteria used for inclusion and exclusion are expounded in *Figure 1*.

**Results**

A total of 68 papers were included in this review. The results of the search are summarized in *Figure 1*. This review included 19 cross-sectional studies, 8 experimental studies, 10 case reports, and 31 reviews following full-text appraisal. Of the cross-sectional studies, three were conducted in Saudi Arabia, 3 in Senegal, 2 in Sweden, 2 in the USA, and 1 in Tanzania, Ghana, Jamaica, Ireland, France, Japan, Canada, Nigeria, and India.

*Figure 1.* Search Results and Exclusion of Articles.



**The Concentration of Mercury in Skin Lightening Agents**

The FDA-approved concentration of mercury in skin lightening products is one part per million (Ppm).<sup>17</sup> Mercurial skin lightening agents are documented to have varying mercury concentrations<sup>8,14,18,19</sup>, including very high levels of 28000-210000ppm.<sup>20</sup> Additionally, mercury is not always listed as an ingredient in these cosmetics, which may contribute to undiscovered cases of exposure.<sup>8,21</sup> Cream formulations were found to have the highest concentrations of mercury, and the common practice of mixing different brands in an attempt to increase their potency was

shown to increase the likelihood of exposure to very high levels of mercury.<sup>8</sup> Application of higher concentrations of mercury can cause more mercury to be absorbed into the bloodstream.

**Toxicokinetics of Mercury**

There are three forms of mercury inorganic, organic, and metallic mercury. Of these three, inorganic mercury is added to skin lightening agents because it can penetrate the skin to cause a lightening effect.<sup>11</sup> Although it is lipophobic, it accumulates in organs such as the liver and kidneys, causing damage to their

cells.<sup>22</sup> In these organs, it binds to glutathione and forms mercury-glutathione compounds excreted in bile and urine.<sup>23, 24</sup> Additionally, inorganic mercury induces increased expression of metallothionein in renal, hepatic, and placental cells and binds to it.<sup>24, 25</sup> By binding in these tissues, mercury accumulates and is removed from the body's circulation. Metallothionein, however, is saturable with increasing doses of mercury, and the ability of these tissues to accumulate mercury may be limited.<sup>24</sup> Mercury bound to metallothionein is excreted slowly from the kidney and liver.<sup>24</sup> It is also excreted, in smaller amounts, in breast milk, bile, sweat, saliva, and lungs.<sup>26</sup>

Inorganic mercury in skin lightening agents may vaporize into its elemental/metallic form, which can be absorbed through the alveolar membrane. Once in the bloodstream, lipophilic elemental mercury crosses lipid membranes all over the body.<sup>23, 27</sup> Thereafter, it is taken into body tissues, including the red blood cells, liver, and central nervous system cells, and is oxidized by cytosolic catalases to inorganic mercury, which remains trapped in these tissues for a long time owing to its lipophobic nature.<sup>28</sup>

#### **Prenatal Exposure to Mercurial Skin Lightening Agents**

The use of skin-lightening agents during pregnancy has been documented.<sup>13,29</sup> In a study conducted in Senegal, pregnancy was documented to trigger the practice of skin lightening or to cause an increase in the use of skin lightening agents, especially during the third trimester.<sup>29</sup> This practice may be attributed to physiological hyperpigmentation that accompanies pregnancy, known as chloasma gravidarum. Expectant women who reported using skin lightening agents during pregnancy generally applied these agents all over their bodies except the abdomen.<sup>29</sup>

Exposure of a pregnant woman to mercury translates to fetal exposure.<sup>21, 30</sup> Inorganic mercury is lipophobic and crosses the blood-placental barrier with difficulty, at a lower rate, and to a lesser degree than organic mercury.<sup>30</sup> In the placenta, it may induce metallothionein expression in placental cells and bind to it.<sup>31</sup> A study showed that the binding of metallothionein and mercury in the placenta reduced the transfer of mercury to the fetus.<sup>31</sup> Despite the protective nature of the bond, mercury binding to placental metallothionein may result in harmful changes in the placenta by accumulating in cell membranes and causing impaired membrane fluidity.<sup>6</sup> Such changes may impair the transport of essential trace elements like selenium<sup>32</sup> amino acids, oxygen, and hormonal production by the placenta, subsequently causing damage to the fetus.<sup>31,33</sup>

A recent study in which pregnant mice were exposed to inorganic mercury documented that a fraction of inorganic mercury in the placenta may be transported via various transport proteins into fetal tissues.<sup>34</sup> Regular and/or chronic exposure of pregnant women to inorganic mercury may result in significant exposure of the fetus.<sup>34</sup> The effects of exposure in utero are dependent on the dose.<sup>35</sup> Inorganic mercury present in the fetal bloodstream may pose an important health risk to the fetus, especially since there

is a trend of higher mercury levels in cord blood compared to maternal blood.<sup>30, 36</sup> Oliveira et al<sup>34</sup> found that fetal mouse tissues are more susceptible to mercury and suffer from more toxicity than adult mice despite the exposure to the same levels of mercury. This may be attributed to the immaturity of fetal renal systems, which cannot excrete mercury as efficiently as adults can, allowing mercury to accumulate in fetal tissues for more extended periods.<sup>30</sup> Such prenatal exposure to mercury, which is nephrotoxic, may result in permanent kidney dysfunction.<sup>2</sup>

In addition to inorganic mercury absorbed trans-dermally, mercury vapor from mercurial skin lightening agents may be inhaled by expectant mothers.<sup>37</sup> In its elemental form, it readily crosses the blood-placental barrier and accumulates in the fetal liver, kidney, and brain.<sup>37</sup> The uptake of elemental mercury in the fetus has been shown to increase with increasing gestational age.<sup>37</sup> Following transfer to the fetus, elemental mercury can cross the blood-brain barrier of the fetus to cause adverse central nervous system effects.<sup>23</sup>

#### **Postnatal Exposure to Mercurial Skin Lightening Agents Breast Milk**

Inorganic mercury is excreted in breast milk,<sup>26,38</sup> breast milk is preferentially enriched with mercury.<sup>39</sup> Bjönberg<sup>31</sup> found that the relationship between maternal plasma mercury and breast milk is such that increasing levels of inorganic mercury in maternal plasma led to an increased level of mercury in breast milk. The concentration of mercury in breast milk has been documented in various countries worldwide, with very high concentrations found in Turkey (25.8 µg/L) and Brazil (6.47 µg/L).<sup>38</sup> Milk to maternal plasma ratios of 0.6-1 have been documented.<sup>31</sup> About 7-15% of ingested inorganic mercury is absorbed.<sup>40,41</sup> Breast milk, therefore, is an important route of exposure to inorganic mercury in children.<sup>38</sup>

#### **Direct Contact**

Some caregivers have been documented to apply skin-lightening agents onto children's skin.<sup>42,43</sup> In addition to this, typical childhood behavior places children in the homes of users at risk of direct contact with the skin lightening agents they may have skin contact with and/or ingest.<sup>43</sup> Children have thinner skin than adults and are likely to absorb more mercury into their bloodstream.<sup>8</sup> Additional factors that increase the absorption of mercury from skin lightening agents include hydration of skin, higher frequency of application, higher external temperature, and surface area over which the agent is applied.<sup>8, 11</sup>

#### **Indirect Contact**

Mercury found in skin lightening agents can vaporize to release elemental mercury when applied onto the users' skin and directly from their holding containers.<sup>44</sup> In the same study, Copan et al found that mercury vapor levels were very high around bedding and dirty laundry of mercurial cream users. In the same study, mercury vapor levels near jars containing the mercurial compounds in users' homes were documented to range between

12 and 999µg/m<sup>3</sup>. Mercury vapor is colorless, tasteless, and does not have any distinct scent. Owing to these characteristics, its presence in the home may go unnoticed for a long period. Pregnant women and young children close to users or containers of mercurial skin lightening agents may inhale the vaporized mercury resulting in respiratory tract trauma<sup>44</sup> and its absorption through the alveolar membrane.<sup>45</sup>

Furthermore, mercury vapor is denser than air and settles near the ground where crawling and playing infants are exposed to it.<sup>46,47</sup> Children breathe more rapidly than adults and inhale more mercury vapor per body than adults exposed to the same dose.<sup>46,48</sup> About 74-80% of the dose of mercury vapor inhaled is absorbed.<sup>45</sup> Through this route, skin lightening agents, are potential sources of elemental mercury exposure to users and nonusers in the same household.<sup>20</sup>

**Reference Values of Mercury in Urine**

According to the German Human Biomonitoring Commission, no adverse health effects are expected when urinary mercury levels are below 7µg/L in children and women of childbearing age.<sup>39</sup> In the same population, urinary mercury levels above 25µg/L are associated with adverse health effects and are levels at which medical practitioners should intervene.

**Effects of Mercury Exposure from Skin Lightening Agents on Children**

The adverse effects of mercury vary with the levels of exposure and duration of exposure. In terms of inhalation of mercury, the concentration of mercury vapor and the duration of exposure result in variable clinical presentations of toxicity (*Table 1*).

*Table 1.* Mercury vapor levels and associated medical relevance.

| Mercury vapor levels                          | Association  |
|---|--|
| 50 µg/m <sup>3</sup>                          | Threshold limit of acceptable mercury vapor levels. <sup>23</sup>  |
| 0.7-42 µg/m <sup>3</sup> (chronic inhalation) | Adverse nervous system effects including impaired cognition sleep disturbance and tremors. <sup>32</sup> |
| 1-2 mg/m <sup>3</sup> (acute)                 | Acute mercurial pneumonitis. <sup>23</sup>   |

**Legend:** Table 1 shows various mercury vapor levels and their associated medical relevance.

**1. At a Cellular Level**

In the cell, mercury binds thiol groups in sulfhydryl-containing enzymes resulting in their dysfunction.<sup>21,49</sup> Additionally, it interrupts cell membrane ion channels to cause impaired membrane transport.<sup>49</sup> It is also a catalyst in the Fenton reaction and may increase cellular production of reactive oxygen species (ROSs), increasing cellular oxidative stress.<sup>32</sup> Children are more prone to cellular damage caused by ROSs because they have less

developed immune defense against them.<sup>38</sup> Al Saleh (2013) showed that reactive oxygen species produced after exposure to inorganic mercury cause oxidative stress. This stress was shown to result in cellular damage in the form of lipid and DNA peroxidation.<sup>38</sup> The same study showed that the combined enzyme dysfunction and cell organelle damage caused by mercury accumulation in cells subsequently leads to cellular, tissue, and organ dysfunction.<sup>18</sup>

Children have higher metabolic rates than adults and rapidly developing organs and organ systems which may be disrupted easily by mercury intoxication.<sup>48</sup> Furthermore, children are less efficient at excreting mercury owing to their less mature metabolic processes.<sup>48</sup>

**2. On the Central Nervous System**

Elemental mercury can cross the blood-placental and blood-brain barriers.<sup>23</sup> Once in the fetal brain, it is oxidized to inorganic mercury, which accumulates in the brain cells owing to its lipophobic nature.<sup>23</sup> In a study inorganic mercury was documented to cross the blood-brain barrier of infant mice after exposure in utero.<sup>50</sup> In the same study, inorganic mercury was shown to accumulate in the hippocampus. Following exposure of mice to inorganic mercury via skin-lightening cosmetics,<sup>51</sup> pathological changes in the brains of exposed mice were documented. These changes included thinning of the cerebral cortex, irregularities of the granular layer of the cortex, and vacuolation in the brainstem and cerebellum.<sup>51</sup> In a study by Chehimi et al.,<sup>52</sup> rats exposed to inorganic mercury prenatally had delayed milestones.

Acrodynia is an idiosyncratic hypersensitivity reaction to mercury intoxication.<sup>46,53</sup> Some children are more susceptible to developing acrodynia than others- about 1 in every 500 children exposed to mercurial teething creams developed the condition.<sup>46</sup> Neurological manifestations of acrodynia in children, including tremor, hypotonia, irritability, apathy, insomnia, and seizures, have been documented.<sup>53-55</sup> Inorganic mercury in the central nervous system has been shown to increase susceptibility to seizures and prolong these seizures.<sup>56</sup>

Mercury has been documented to enter the neuron through calcium and sodium channels and cause permanent depolarization, resulting in neurotransmitter release.<sup>57</sup> It, therefore, causes an increase in the release of excitatory neurotransmitters such as glutamate and decreases their uptake from synaptic clefts by astrocytes.<sup>58</sup> In addition to this, mercury may cause the decreased synthesis of gamma-Aminobutyric acid (GABA), the main inhibitory neurotransmitter in the nervous system.<sup>59</sup> This results in high levels of excitatory neurotransmitters in the extracellular compartment that may cause the over-activation of N-methyl-d-aspartate receptors.<sup>58</sup> Owing to the decreased levels of GABA, the excitatory activity of glutamate is unopposed and may cause neurons to enter an excitotoxic cascade.<sup>58</sup>

Mercury has been documented to cause calcium homeostasis disruption resulting in impaired action potential transmission.<sup>58</sup> Additionally, mercury causes inflammation and induces the production of high levels of ROSs by microglia.<sup>59</sup> ROSs produced cause mitochondrial dysfunction, lipid and DNA peroxidation, and cause apoptosis and necrosis of neuronal cells.<sup>58,59</sup>

In neuronal cells, inorganic mercury has been documented to inhibit neuronal cell differentiation by inhibiting the activity of retinoic acid, altering the expression of Microtubule Associated Proteins, and reducing the expression of tubulin  $\beta$ III needed for polymerization of microtubules.<sup>10</sup> Mercury-induced tubulin insufficiency disrupts the scaffolding required for axonal and dendritic formation.<sup>59</sup> Subsequently, axons and dendrites collapse and undergo degeneration.<sup>59</sup> In these ways, mercury impairs mitosis, disrupts neuronal migration, and is a potent neurotoxin in prenatal and postnatal periods.<sup>60</sup>

### 3. On the Cardiovascular System

Copan et al<sup>44</sup> found that hypertension was a common clinical sign in children exposed to mercury from skin lightening agents and soaps. Mercury inactivates S-adenosyl-methionine causing increased levels of catecholamines.<sup>61</sup> The rise in catecholamines may cause a mercury-intoxicated individual to present with tachycardia, hypertension caused by vasoconstriction, hypersalivation, and hyperhidrosis.<sup>32</sup> Mercury may also contribute to dysfunctional parasympathetic and sympathetic cardiac control in exposed children.<sup>62</sup>

It has been documented to cause increased production of ROSs such as superoxide ions.<sup>27</sup> ROSs may bind to nitric oxide produced by endothelial cells to form peroxynitrite. Peroxynitrite may cause myocyte cell toxicity and decrease the availability of nitric oxide necessary for vasodilation.<sup>27</sup> In addition to causing vasoconstriction via increased sympathetic outflow, mercury may cause reduced vasodilation due to decreased nitric oxide levels and contribute to cases of unexplained hypertension in young age groups.<sup>44,62,63</sup>

Mercury has been documented to induce autoimmune diseases such as Kawasaki disease in genetically susceptible individuals.<sup>55</sup> However, the clinical presentation of Kawasaki disease can resemble acro-dynia<sup>55</sup> and acro-dynia should be considered as a differential.

### 4. On the Liver

A young child exposed to mercury vapors, from heating an unknown quantity of mercury, was documented to elevated serum alanine aminotransferase, serum bilirubin, and ornithine carbamoyltransferase following its inhalation.<sup>35</sup> Mercury exposure, in this case, was found to cause some degree of hepatic dysfunction. An infant who ingests inorganic mercury in mercuric chloride was documented to present with hepatic enlargement.<sup>35</sup>

Following the application of mercurial skin lightening agents onto adult mice, inorganic mercury was documented to cause loss of

hepatic cells, vacuolation of hepatic cells as well as an increase in Kupffer cells.<sup>51</sup> To the best of our knowledge, no studies on specific clinical hepatic dysfunction in children exposed to inorganic mercury have been published.

### 5. On the Gastrointestinal System

Gastrointestinal manifestations of acro-dynia include salivation, loss of teeth, gum irritation and gingivitis, diarrhea, and anorexia.<sup>54</sup> Ingestion of inorganic mercury in the form of mercuric chloride may be highly irritating to the gastrointestinal mucosa and has been documented to cause ulceration and blisters on the lips and tongue of a 19-month-old child.<sup>35</sup>

Intestinal bacteria exposed to inorganic mercury have been documented to develop resistance to antibiotics.<sup>64</sup> Additionally, inorganic mercury that is ingested may be absorbed into gastrointestinal cells and prevent the synthesis and secretion of digestive enzymes such as trypsin, chymotrypsin, and pepsin.<sup>18</sup> The above may result in indigestion in children that ingest mercury in breast milk.<sup>32</sup>

### 6. On the Kidney

Inorganic mercury is nephrotoxic and children are more susceptible to its effects.<sup>38</sup> Following exposure to inorganic mercury in utero, the highest load of mercury is in fetal kidneys.<sup>34</sup> The amount of accumulated mercury in the fetal kidneys was positively associated with the dose of mercury to which the pregnant mice were exposed.<sup>34</sup>

Repeated applications of mercurial skin lightening creams on mice have been documented to accumulate mercury in the kidney and cause nephrotic syndrome.<sup>51</sup> Additional pathological effects seen in the kidneys of mice exposed to mercurial compounds in skin lightening creams include focal atrophy of glomerulus, dilatation or obliteration of Bowman's capsule, and vacuolation tubular cells, eosinophilic bodies in proximal tubules, and lymphoid hyperplasia.<sup>51</sup> Mercury induced glomerulonephritis has been documented as an autoimmune response to mercury intoxication following exposure to mercurial skin lightening agents and pathologically presents with macrophage and monocyte infiltration.<sup>65</sup>

In the kidney, inorganic mercury is bound to both glutathione and metallothionein, reducing the amount of mercury circulating in the blood.<sup>24</sup> Variations in endogenous levels of the glutathione and metallothionein give rise to variable sensitivity to inorganic mercury and variations in the severity of the extra-renal mercury-induced disease.<sup>24</sup> Mercury commonly affects the proximal tubules in the kidney.<sup>19</sup> It causes damage to these cells and results in the release of intracellular enzymes such as lysosomal N-acetyl- $\beta$ -d-glucosaminidase, lactate dehydrogenase, and aspartate aminotransferase.<sup>65</sup> The extent of kidney damage due to chronic mercury exposure corresponds to urinary levels of mercury. Levels above 25 $\mu$ g of mercury per Liter of urine are associated with adverse clinical outcomes (**Table 2**).

**Table 2.** Urinary mercury levels and their clinical relevance.

| Urinary mercury level ( $\mu\text{g}$ of HG/L of urine) | Clinical relevance                               |
|---|--|
| Less than 7 (HBM I value)                               | Adverse outcomes are not expected. <sup>39</sup> |
| More than 25 (HBM II value)                             | Adverse outcomes are expected. <sup>39</sup>     |
| 150   | High likelihood of kidney disease. <sup>6</sup>  |

**Legend:** Table 2 shows the clinical relevance of urinary mercury levels.

### 7. On the Endocrine System

Inorganic mercury has been documented to accumulate in the cells of the pituitary glands.<sup>66</sup> Luteinizing hormone (LH) produced by the anterior pituitary gland has a sequence of cysteine residues to which mercury has a high affinity.<sup>66</sup> Mercury causes dysfunction of LH, resulting in dysfunctional androgen synthesis.<sup>66</sup> The androgen imbalance caused by mercury-induced LH dysfunction has been put forward as a possible etiology of autism in mercury-sensitive children exposed to mercury early on in life.<sup>66</sup> The accumulation of mercury in the pituitary gland early in neurodevelopment may induce inflammation within the gland.<sup>66</sup> The mercury-induced inflammation may impair migration of neural precursors of thyrotrophs and impair their incorporation into the gland, ultimately impairing thyroid gland function.

### 8. On the Immune System

A recent study documented higher levels of inorganic mercury in cord blood of children born to mothers who continued to carry out skin bleaching during pregnancy.<sup>67</sup> These levels of mercury in cord blood were associated with lower fetal Immunoglobulin G levels, which may be associated with increased susceptibility to disease.<sup>67</sup> Chronic exposure to inorganic mercury has been documented to exacerbate systemic lupus erythematosus<sup>29,47</sup>, induce systemic autoimmunity and negatively influence several functions of neutrophils.<sup>68</sup>

### 9. On the Skin

Inorganic mercury applied onto the skin has been documented to cause dermatitis, allergic reactions, and acrodynia in children.<sup>18</sup> Acrodynia is an idiosyncratic hypersensitivity reaction occurring in children exposed to inorganic mercury. It presents with cutaneous lesions that include pain, alopecia, swelling of the hands, feet, and nose, desquamation, loss of nails, and, in severe cases, gangrene of fingers and toes.<sup>53-55,65</sup>

Exposure to mercury early on in life may result in numerous adverse systemic effects in children who are typically more sensitive to its harmful effects than adults. Children's organ systems and tissues are rapidly developing, and damage at these stages may culminate in organ dysfunction that can extend into old age and cause morbidity and mortality later in life.

### Conclusion

Many individuals widely use skin lightening creams to achieve lighter skin tones to meet societal standards of beauty and improve the appearance of hyperpigmentation and other skin blemishes. They may, however, pose detrimental health effects to children exposed to them prenatally and in early childhood. Some of these harmful effects include acrodynia, nephrotic syndrome, glomerulonephritis dermatitis, among others. Our findings provide a detailed summary of these harmful effects and their mechanisms and may equip healthcare providers to counsel their at-risk patients appropriately and encourage them to avoid their use during pregnancy.

### Recommendation

This review paper brought to our attention that several studies have demonstrated the effects of mercury toxicity on children, but the threshold for toxicity remains poorly elucidated in the literature. As such, we recommend that the toxicity threshold in children be investigated further. In addition to this, the epidemiology of inorganic mercury toxicity, particularly in populations where skin lightening is practiced, is poorly elucidated in the literature. We, therefore, recommend an investigation of the epidemiology of pediatric inorganic mercury toxicity among these populations to gain a complete picture of its burden on child health.

## References

- Charles C. Skin Bleaching, Oppression and Black Resistance. Social Science Research Network; 2014 Nov. Available from: <https://dx.doi.org/10.2139/ssrn.2519822>. Last updated January 6 2016; cited August 4 2020.
- Al-Saleh I, Shinwari N, Al-Amodi M. Accumulation of Mercury in Ovaries of Mice After the Application of Skin-lightening Creams. *Biol Trace Elem Res.* 2009;131(1):43–54.
- Lewis K, Robkin N, Gaska K, Njoki L. Investigating Motivations for Women's Skin Bleaching in Tanzania. *Psychol Women Q.* 2011;35:29–37.
- Mahe A, Ly F, Aymard G, Dangou JM. Skin diseases associated with the cosmetic use of bleaching products in women from Dakar, Senegal. *Br J Dermatol.* 2003;148(3):493–500.
- Risher JF, De Rosa CT. Inorganic: the other mercury. *J Environ Health.* 2007;70(4):9–16; discussion 40.
- Voegborlo RB, Agorku SE, Buabeng-Acheampong B, Zogli E. Total Mercury Content Of Skin Toning Creams And The Potential Risk To The Health Of Women In Ghana. *J Sci Technol.* 2008
- Al-Saleh IA. Health implications of mercury exposure in children. *Int J Environ Health.* 2009;3(1):22–57.
- Ricketts P, Knight C, Gordon A, Boischio A, Voutchkov M. Mercury Exposure Associated with Use of Skin Lightening Products in Jamaica. *J Health Pollut.* 2020;10(26):200601.

9. Kain T, Weinstein J, Thompson A, Boggild AK. The "wing-heeled" traveler. *Trop Dis Travel Med Vaccines*. 2020;6(1):2.
10. Chan TYK, Chan APL, Tang HL. Nephrotic syndrome caused by exposures to skin-lightening cosmetic products containing inorganic mercury. *Clin Toxicol*. 2020;58(1):9–15.
11. Palmer RB, Godwin DA, McKinney PE. Transdermal Kinetics of A Mercurous Chloride Beauty Cream: An *In Vitro* Human Skin Analysis. *J Toxicol Clin Toxicol*. 2000;38(7):701–7.
12. Cullen E, Evans DS, Davidson F, Burke P, Burns D, Flanagan A, et al. Mercury exposure in Ireland: results of the DEMOCOPHES human biomonitoring study. *Int J Environ Res Public Health*. 2014;11(9):9760–75.
13. AlGhamdi K. The use of topical bleaching agents among women: a cross-sectional study of knowledge, attitude and practices: The use of topical bleaching agents among women. *J Eur Acad Dermatol Venerol*. 2010;24(10):1214–9.
14. Al-Saleh I. Potential health consequences of applying mercury-containing skin-lightening creams during pregnancy and lactation periods. *Int J Hyg Environ Health*. 2016;219(4–5):468–74.
15. Boyd AS, Seger D, Vannucci S, Langley M, Abraham JL, King LE. Mercury exposure and cutaneous disease. *J Am Acad Dermatol*. 2000;43(1):81–90.
16. Petit A, Cohen-Ludmann C, Clevenbergh P, Bergmann J-F, Dubertret L. Skin lightening and its complications among African people living in Paris. *J Am Acad Dermatol*. 2006;55(5):873–8.
17. US Food and Drug Administration . FDA Cosmetics Handbook. Department of Health and Human Services, Public Health Service; 1992.
18. Agrawal SS, Mazhar M. Adulteration of mercury in skin whitening creams – A nephrotoxic agent. *Curr Med Res Pract*. 2015;5(4):172–5.
19. Sin KW, Tsang HF. Large-scale mercury exposure due to a cream cosmetic: community-wide case series. *Hong Kong Med J Xianggang Yi Xue Za Zhi*. 2003;9(5):329–34.
20. Copan L, Ujihara A, Jones C, Das R, Kreutzer R, Roisman R, et al. Mercury exposure among household users and nonusers of skin-lightening creams produced in Mexico - California and Virginia, 2010. *Morb Mortal Wkly Rep*. 2012;61:33–6.
21. Budnik LT, Casteleyn L. Mercury pollution in modern times and its socio-medical consequences. *Sci Total Environ*. 2019;654:720–34.
22. Martinez-Finley EJ, Aschner M. Recent Advances in Mercury Research. *Curr Environ Health Rep*. 2014;1(2):163–71.
23. Asano S, Eto K, Kurisaki E, Gunji H, Hiraiwa K, Sato M, et al. Review article: acute inorganic mercury vapor inhalation poisoning. *Pathol Int*. 2000;50(3):169–74.
24. Tokumoto M, Lee J-Y, Shimada A, Tohyama C, Satoh M. Glutathione has a more important role than metallothionein-I/II against inorganic mercury-induced acute renal toxicity. *J Toxicol Sci*. 2018;43(4):275–80.
25. Al-Saleh I, Abduljabbar M, Al-Rouqi R, Eltabache C, Al-Rajudi T, Elkhatib R, et al. The extent of mercury (Hg) exposure among Saudi mothers and their respective infants. *Environ Monit Assess*. 2015;187(11):678.
26. Risher JF; World Health Association and Interantional Programme on Chemical Safety. Elemental mercury and inorganic mercury compounds: human health aspects. Available from <https://apps.who.int/iris/handle/10665/42607>. Last updated 2003; cited August 9 2020.
27. Fernandes Azevedo B, Barros Furieri L, Peçanha FM, Wiggers GA, Frizera Vassallo P, Ronacher Simões M, et al. Toxic effects of mercury on the cardiovascular and central nervous systems. *J Biomed Biotechnol*. 2012;949048.
28. Davis BJ. Mercury Vapor and Female Reproductive Toxicity. *Toxicol Sci*. 2001;59(2):291–6.
29. Mahé A, Perret JL, Ly F, Fall F, Rault JP, Dumont A. The cosmetic use of skin-lightening products during pregnancy in Dakar, Senegal: a common and potentially hazardous practice. *Trans R Soc Trop Med Hyg*. 2007;101(2):183–7.
30. World Health Organization. Children's Exposure to Mercury Compounds . WHO. World Health Organization; 2010 Available from: [http://www.who.int/ceh/publications/children\\_exposure/en/](http://www.who.int/ceh/publications/children_exposure/en/) Last updated 2010; cited August 5 2020.
31. Ask Björnberg K. Mercury exposure during early human development . Institutet för miljömedicin (IMM) / Institute of Environmental Medicine; 2005. Available from: <http://openarchive.ki.se/xmlui/handle/10616/37829>. Last updated April 1 2005; cited August 4 2020
32. Rice KM, Walker EM, Wu M, Gillette C, Blough ER. Environmental mercury and its toxic effects. *J Prev Med Public Health Yebang Uihakhoe Chi*. 2014;47(2):74–83
33. Ask K, Akesson A, Berglund M, Vahter M. Inorganic mercury and methylmercury in placentas of Swedish women. *Environ Health Perspect*. 2002;110(5):523–6.
34. Oliveira CS, Joshee L, Zalups RK, Pereira ME, Bridges CC. Disposition of inorganic mercury in pregnant rats and their offspring. *Toxicology*. 2015;335:62–71.
35. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological profile for mercury. Available from: [https://hero.epa.gov/hero/index.cfm/reference/details/reference\\_id/1256999](https://hero.epa.gov/hero/index.cfm/reference/details/reference_id/1256999). Last updated 1999. Cited August 6 2020.
36. Butler Walker J, Houseman J, Seddon L, McMullen E, Tofflemire K, Mills C, et al. Maternal and umbilical cord blood levels of mercury, lead, cadmium, and essential trace elements in Arctic Canada. *Environ Res*. 2006;100(3):295–318.
37. Yoshida M. Placental to Fetal Transfer of Mercury and Fetotoxicity. *Tohoku J Exp Med*. 2002;196(2):79–88.
38. Al-Saleh I, Abduljabbar M, Al-Rouqi R, Elkhatib R, Alshabbaheen A, Shinwari N. Mercury (Hg) Exposure in Breast-Fed Infants and Their Mothers and the Evidence of Oxidative Stress. *Biol Trace Elem Res*. 2013;153(1–3):145–54.
39. Ruggieri F, Majorani C, Domanico F, Alimonti A. Mercury in Children: Current State on Exposure through Human Biomonitoring Studies. *Int J Environ Res Public Health*. 2017;14(5):519.
40. Goldman LR, Shannon MW, the Committee on Environmental Health. Technical Report: Mercury in the Environment: Implications for Pediatricians. *Pediatrics*. 2001;108(1):197–205.
41. Park J-D, Zheng W. Human exposure and health effects of inorganic and elemental mercury. *J Prev Med Public Health Yebang Uihakhoe Chi*. 2012;45(6):344–52.
42. Darj E, Infanti JJ, Ahlberg BM, Okumu J. "The fairer the better?" Use of potentially toxic skin bleaching products. *Afr Health Sci*. 2015;15(4):1074–80.
43. Kampalath RA, Jay JA. Sources of Mercury Exposure to Children in Low- and Middle-Income Countries. *J Health Pollut*. 2015;5(8):33–51.
44. Copan L, Fowles J, Barreau T, McGee N. Mercury Toxicity and Contamination of Households from the Use of Skin Creams Adulterated with Mercurous Chloride (Calomel). *Int J Environ Res Public Health*. 2015;12(9):10943–54.
45. Oz SG, Tozlu M, Yalcin SS, Sozen T, Guven GS. Mercury vapor inhalation and poisoning of a family. *Inhal Toxicol*. 2012;24(10):652–8.
46. Lai O, Parsi K, Wu D, Konia T, Younts A, Sinha N, et al. Mercury toxicity presenting as acrodynia and a papulovesicular eruption in a 5-year-old girl. *Dermatol Online J*. 2016;22(3).
47. Rogers HS, McCullough J, Kieszak S, Caldwell KL, Jones RL, Rubin C. Exposure assessment of young children living in Chicago communities with historic reports of ritualistic use of mercury. *Clin Toxicol Phila Pa*. 2007;45(3):240–7.
48. Dunn AM, Burns C, Sattler B. Environmental health of children. *J Pediatr Health Care*. 2003;17(5):223–31.
49. Ozuah PO. Mercury poisoning. *Curr Probl Pediatr*. 2000 Mar 1;30(3):91–9.
50. Feng W, Wang M, Li B, Liu J, Chai Z, Zhao J, et al. mercury and trace element distribution in organic tissues and regional brain of fetal rat after in utero and weaning exposure to low dose of inorganic mercury. *Toxicol Lett*. 2004;152(3):223–34.
51. Al-Saleh I, El-Doush I, Shinwari N, Al-Baradei R, Khogali F, Al-Amodi M. Does low mercury containing skin-lightening cream (Fair & Lovely) affect the kidney, liver, and brain of female mice? *Cutan Ocul Toxicol*. 2005;24(1):11–29.
52. Chehimi L, Roy V, Jeljeli M, Sakly M. Chronic exposure to mercuric chloride during gestation affects sensorimotor development and later behaviour in rats. *Behav Brain Res*. 2012;234(1):43–50.
53. Abbaslou P, Zaman T. A child with elemental mercury poisoning and unusual brain MRI findings. *Clin Toxicol*. 2006;44(1):85–8.
54. De Bont B, Lauwerys R, Govaerts H, Moulin D. Yellow mercuric oxide ointment and mercury intoxication. *Eur J Pediatr*. 1986;145(3):217–8.
55. Guzzi G, Pigatto PD. Metal Allergy: Mercury. In: Chen JK, Thyssen JP, editors. *Metal Allergy: From Dermatitis to Implant and Device Failure* [Internet]. Cham: Springer International Publishing; 2018 [cited 2020 Aug



- 6]. p. 397–421. Available from: [https://doi.org/10.1007/978-3-319-58503-1\\_31](https://doi.org/10.1007/978-3-319-58503-1_31)
56. Szász A, Barna B, Gajda Z, Galbács G, Kirsch-Volders M, Szenté M. Effects of continuous low-dose exposure to organic and inorganic mercury during development on epileptogenicity in rats. *Neurotoxicology*. 2002;23(2):197–206.
  57. World Health Organization, International Programme on Chemical Safety (IPCS). Inorganic mercury. WHO; 1991. Available from: <https://apps.who.int/iris/handle/10665/40626>. cited 2020 Aug 6.
  58. Wallace DR, Lienemann E, Hood AN. Clinical aspects of mercury neurotoxicity. In: *Clinical Neurotoxicology*. Elsevier; 2009 [cited 2020 Aug 5]. p. 251–8. Available from: <https://linkinghub.elsevier.com/retrieve/pii/C20090375686>
  59. Kern JK, Geier DA, Audhya T, King PG, Sykes LK, Geier MR. Evidence of parallels between mercury intoxication and the brain pathology in autism. *Acta Neurobiol Exp (Warsz)*. 2012;72(2):113–53.
  60. Tchounwou PB, Ayensu WK, Ninashvili N, Sutton D. Environmental exposure to mercury and its toxicopathologic implications for public health. *Environ Toxicol*. 2003;18(3):149–75.
  61. Baum CR. Mercury: What's In It For Kids? *Clin Pediatr Emerg Med*. 2012;13(4):324–30.
  62. Bose-O'Reilly S, McCarty KM, Steckling N, Lettmeier B. Mercury Exposure and Children's Health. *Curr Probl Pediatr Adolesc Health Care*. 2010;40(8):186–215.
  63. Wössmann W, Kohl M, Grüning G, Bucszy P. Mercury intoxication presenting with hypertension and tachycardia. *Arch Dis Child*. 1999;80(6):556–7.
  64. Summers AO, Wireman J, Vimy MJ, Lorscheider FL, Marshall B, Levy SB, et al. mercury released from dental "silver" fillings provokes an increase in mercury- and antibiotic-resistant bacteria in oral and intestinal floras of primates. *Antimicrob Agents Chemother*. 1993;37(4):825–34.
  65. Gardner R, Nyland J. Immunotoxic Effects of Mercury. In 2016. p. 273–302.
  66. Laks DR. Luteinizing hormone provides a causal mechanism for mercury associated disease. *Med Hypotheses*. 2010;74(4):698–701.
  67. Obiageli AN. Immunoglobulin levels in maternal blood, cord blood and breast milk of Nigerian pregnant women using hydroquinone and non-hydroquinone containing skin lightening creams. *Our Dermatol Online*. 2019;10(2):131–7.
  68. Pollard KM, Cauvi DM, Toomey CB, Hultman P, Kono DH. Mercury-induced inflammation and autoimmunity. *Biochim Biophys Acta Gen Subj*. 2019;1863(12):129299.

### Acknowledgments

We would like to express our deep gratitude to Doctor Nicholas Mosoba and Anita Wambui Mwaura for proofreading this work.

### Conflict of Interest Statement & Funding

The Authors have no funding, financial relationships or conflicts of interest to disclose.

### Author Contributions

Conceptualization, Methodology, Validation, Writing-Original Draft Preparation: RM, FG, TA; Data Curation: RM, FG; Formal Analysis, Investigation, Project Administration: RM; Resources: RM, MM; Supervision: FG, TA, MM; Visualization: RM, FG, TA, MM; Writing- Review and Editing: MM.

### Cite as

Murerwa R, Gwala F, Amuti T, Muange M. Childhood effects of prenatal and postnatal exposure to mercurial skin lightening agents. *Literature Review*. *Int J Med Stud*. 2022 Jan-Mar;10(1):74-81.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://open.library.pitt.edu/)



# Dyke-Davidoff-Masson Syndrome: A Case Report

Gaurav M. Urs,<sup>1</sup> Hitesh R. Doddabele.<sup>2</sup>

## Abstract

**Background:** Dyke-Davidoff-Masson syndrome (DDMS) is a neurological syndrome characterized by the presence of convulsions, facial asymmetry due to palsy of the facial nerve (CN VII), contralateral hemiplegia, and reduced intellectual capacity. **The Case:** We report a case of DDMS in a 20-year-old male who is a previously known case of generalized epilepsy on medication presenting with status epilepticus and initially managed by anticonvulsants. On admission, the seizures manifested again which required the patient to be sedated with injectable anesthetics and intubated. Clinical examination showed no focal neurological deficits or neurocutaneous markers. Imaging studies showed characteristic features of DDMS which were hemiatrophy of the right cerebrum with calvarial thickening, and sinuses showing hyperpneumatization on the same side as hemiatrophy. Previous history of such episodes had been recorded and the patient was kept on strict pharmacotherapy. Failure of adherence to these led to the current presentation. The diagnosis of DDMS was kept and the patient was treated conservatively with anticonvulsants and referred to a higher center for further management. **Conclusion:** DDMS, being a rare but important cause of refractory epilepsy, is easily missed on initial assessment and failure of adequate management leads to higher rates of morbidity and mortality associated with this syndrome. In cases with an atypical presentation, such as this one, a good background in radio-imaging and knowledge of the physical manifestations are required for final diagnosis.

**Key Words:** Seizures; Neuroimaging; Anticonvulsants; Cerebral atrophy; Hemiplegia; Dyke-Davidoff-Masson syndrome (Source: MeSH-NLM).

## Introduction

In the year 1993 three researchers Dyke, Davidoff, and Masson came across peculiar radiographic images of cerebral hemiatrophy and compensatory hypertrophy of calvarium and frontal sinuses in nine patients who clinically presented with seizures, facial hemiparesis, and learning/developmental disabilities - thus forming the typical presentation of this syndrome and named it as Dyke-Davidoff-Masson Syndrome (DDMS).<sup>1</sup> This condition usually results from a perinatal insult, which further leads to the loss of neurons compromising the development of the brain either focally, or as a whole, leading to the spectrum of clinical features.<sup>2</sup> The major concern is the occurrence of such convulsive episodes for which pharmacotherapy alone is insufficient in most of the cases, and where surgical management is eventually advised.<sup>3</sup> We are hereby describing the clinical and radiological features of this syndrome in a young adult presenting to us with refractory seizures.

## The Case

A 20-year-old male patient presented to our emergency department with sudden onset of involuntary movements of both limbs, upward gazing of eyes, frothing of the mouth, involuntary micturition, and tongue bite. The patient's attendants

## Highlights:

- Refractory seizures are not only problematic to manage in terms of medications but also hamper the quality of life of such individuals not restricted to the pathology of the causative factor but also the adverse effects of ASDs.
- The absence of characteristic features of this syndrome such as hemiparesis, mental retardation, facial palsy makes it easier to miss out on the diagnosis of DDMS with seizures being the presenting feature and its rarity of occurrence in our case.
- Early recognition of this syndrome would lead to better management in terms of both therapeutic as well as rehabilitative, thus improving the quality of life of such individuals by preventing intellectual decline.

gave a history of 10-12 seizures since the previous night before arrival to the hospital with episodes of loss of consciousness for more than 30 minutes and post-ictal confusion for a period of 45 minutes. His seizure was managed with a dose of Lorazepam (2mg) followed by Levetiracetam (1g) intravenously. Blood samples were collected and sent for blood sugar levels, complete metabolic panel, and complete hemogram, in order to rule out the common causes of seizures. After stabilization with lorazepam and levetiracetam, the patient was in a state of post-ictal confusion, and admission to the medical intensive care unit was

<sup>1</sup> Intern Doctor, Department of Internal Medicine, Adichunchanagiri Hospital and Research Centre, Nagamangala, Karnataka, India.

<sup>2</sup> Third-year medical student, Department of Internal Medicine, Adichunchanagiri Hospital and Research Centre, Nagamangala, Karnataka, India.

**About the Author:** Gaurav M Urs recently graduated from Adichunchanagiri Institute of Medical Sciences, Karnataka, India, and is currently working at Adichunchanagiri Hospital and Research Centre, Karnataka, India as an Intern Doctor. Hitesh R Doddabele is a third-year medical student at Adichunchanagiri Institute of Medical Sciences, Karnataka, India.

## Correspondence:

Gaurav M. Urs. <https://orcid.org/0000-0003-3484-6963>

Address: NH75, Karnataka 571448, India

Email: [gauravmurs@bgsaims.edu.in](mailto:gauravmurs@bgsaims.edu.in)

Editor: Francisco J. Bonilla-Escobar  
Student Editors: Ciara Egan  
Copyeditor: Adnan Mujanovic  
Proofreader: Madeleine J. Cox  
Layout Editor: Judie Joo

Submission: Apr 5, 2020  
Revisions: May 8, 2020  
Responses: Apr 2, 2020  
Acceptance: Aug 25, 2020  
Publication: Dec 14, 2020  
Process: Peer-reviewed

taken up for monitoring and further investigations. Further tests for liver and renal functions were conducted.

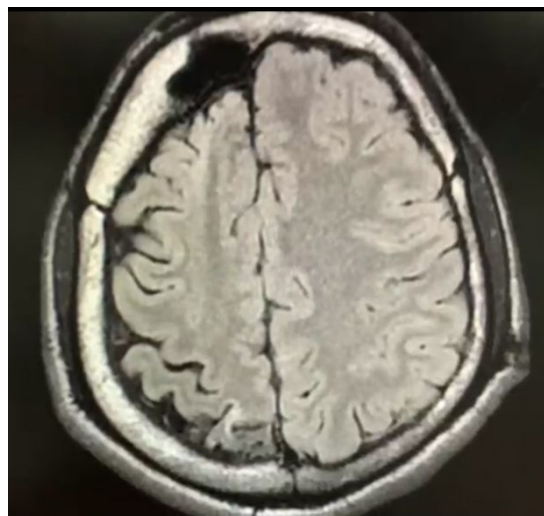
The patient was a known case of seizure disorders since the age of 17, with left focal onset seizures in his upper limb generalizing to both upper and lower limbs and was on pharmacotherapy (Sodium valproate 300mg BD, Phenobarbital 60mg BD, Clobazam 10mg BD). The seizure episodes started at the age of 3 and were managed under the above-mentioned antiepileptics. Seizures were usually preceded by neck pain, nausea, and involuntary movements of the right hand, diagnosed as idiopathic generalized epilepsy by the local physician, and kept as the diagnosis without further investigations or referral to a higher center. They also gave a history of episodic seizures which were managed by increasing the dosage of Clobazam to 20mg BD instead of regular dosing of 10mg BD. Consanguinity was not seen in the family tree. Uneventful perinatal history was given by the patient's attenders. There were no similar complaints in the immediate family. The parents noted learning difficulties and took him off from schooling in his first grade. He can speak in his mother tongue fluently. Motor developmental milestones were developed at appropriate ages.

On admission to the medical intensive care unit, the patient remained stable shortly for an hour and then presented with the second episode of seizures, initially with focal seizures of the left hand with secondary generalization. Patient was treated with Lorazepam 2mg, Levetiracetam 1g, Sodium Valproate 1g, Phenobarbitone 1g, following sedation with Midazolam infusion at 0.2mg/kg/hr, and mechanical ventilation, due to the seizure not being controlled by the above medications. Mechanical ventilation was continued for the next 4 days, then weaned off and extubated. On extubation, the patient remained stable and vital signs were near normal with no new onset of seizure episodes. Initially sent blood tests showed no significant findings.

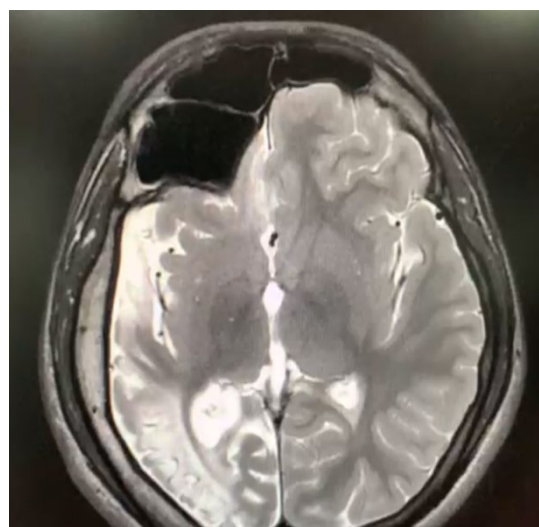
The clinical examination of the central nervous system was normal and did not reveal any neurocutaneous lesions. He scored poorly on the Mini-Mental Status Examination (14/30), with brisk tendon reflexes and flexor plantar response. A magnetic resonance imaging (MRI) of the brain was subsequently done, which revealed right cerebral atrophy, with gliotic and encephalomalacic changes together with compensatory thickening of the cranial vault (*Figure 1*), and enlargement of frontal and hemisphenoid sinuses on the right side, with an elevation of the right petrous edge (*Figure 2*). An electroencephalogram (EEG) report, which was performed 3 years ago, showed abnormal EEG changes with generalized seizure discharges and diffuse background slowing.

We accordingly kept a diagnosis of DDMS, managed him conservatively with the above mentioned antiepileptics, and referred him to a comprehensive center for further management upon the patient's attendees' request. The patient's attendees refused surgical intervention due to financial constraints, and are

**Figure 1.** MRI Showing Right Cerebral Atrophy with Gliotic and Encephalomalacic Changes Along with Compensatory Thickening of Cranial Vault.



**Figure 2.** MRI Showing Enlargement of Frontal and Hemisphenoid Sinuses on the Right Side with Elevation of the Right Petrous Edge.



continuing the anticonvulsants. Informed consent for publication was obtained from the patient's representative.

## Discussion

DDMS, which is a rare but important condition commonly associated with refractory seizures, was first documented by Dyke, Davidoff, and Masson in 1933 when they noted radiographic images in a series of 9 patients with similar presentations.<sup>1</sup> Total and subtotal cortical hemiatrophy is the pathognomonic radiological finding in this syndrome, while sometimes unilateral cerebral atrophy is also noted in the cerebral peduncles, thalamus, pons, cerebellar crossings, and surrounding areas. Neuroimaging shows prominent sulcus over

the cerebrum, lateral ventricles dilated in certain parts, increase in the CSF spaces, calvarial thickening, osseous hypertrophy on the same side as the hemiatrophy with hyperpneumatization of the frontal and mastoid sinuses, and an elevated calvarium on the temporal side. Both sexes are equally affected in this case and any part of the brain can be equally involved as well, although left-sided involvement and male preponderance have been more frequently observed in one particular case study.<sup>4</sup> The clinical features of this syndrome are hemiparesis on the same side as hemiatrophy, with an upper motor neuron type palsy of the facial nerve (CN VIII), focal or generalized convulsions, and poor intellect with a delay in the achievement of milestones either occurring alone or in combination based on the side of hemiatrophy.<sup>5</sup>

Refractory epilepsy has many etiologies. These are commonly associated with failure of adherence to antiepileptic drugs, and include seizures that are non-epileptic, misdiagnosed, or inappropriate use of medications such as inadequate dosing, drug-to-drug interactions, and lifestyle choices such as alcohol & drug abuse, stress, and sleep deprivation.<sup>6</sup> Identification of the causative etiology is essential in planning its management, since refractory seizures are associated with high rates of morbidity and mortality. Out of the variety of tests available to investigate epilepsy, neuroimaging is the main tool used in its investigation. We came across this rare case of Dyke-Davidoff-Masson syndrome presenting as refractory seizures alone without the other typical features mentioned above.

Of the two types of cerebral hemiatrophy, the infantile subtype results from perinatal vascular insult usually involving the middle or anterior cerebral artery, coarctation of aortic arch; or common early neonatal sepsis thus presenting with the symptoms subsequently in the age group when the insult had occurred. Other, acquired, subtype of DDMS usually results from hypoxic-ischemic encephalopathy, pyrexia seizures of prolonged duration, traumatic insult, or from neoplastic or infectious etiology, along with hemorrhagic and ischemic causes.<sup>7-8</sup> The classical MRI changes of this disease, which are hemiatrophy and hyperpneumatization of sinuses, are observed radiographically only if the causative factor has acted upon the developing brain before the age of three.<sup>9</sup>

The differential diagnosis of this presentation seen in our case includes Sturge-Weber syndrome and Rasmussen encephalitis. Also, certain syndromes like Fishman syndrome, Silver-Russell syndrome, and linear nevus syndrome have to be kept in the picture as rare but possible causes. These syndromes are recognized through neuroimaging and clinical correlation.<sup>10-11</sup> Sturge-Weber syndrome is presented clinically by port-wine nevus on the face, epilepsy, ophthalmic manifestations primarily being increased intraocular pressure, learning difficulties, and stroke-like features occurring frequently. The underlying pathology is due to intracranial vascular anomaly and leptomeningeal angiomatosis and stasis causing the

pathognomonic intracranial tram track calcification with laminar cortical necrosis leading to atrophy.<sup>12</sup> Rasmussen encephalitis, an immune-mediated progressive chronic condition occurring commonly in the younger age group of six to eight years, with the child presenting with intractable focal onset epilepsy and cognitive defects with imaging findings similar to that of hemi cerebral atrophy but no significant calvarial changes.<sup>13</sup> Silver-Russell syndrome is characterized by its unique facial phenotype, poor attainment of physical parameters such as height and bone length, clinodactyly, cerebral hemihypertrophy without affecting the head circumference, and no deranged mental capacity.<sup>14</sup> Fishman syndrome is a neurocutaneous syndrome occurring rarely which presents with unilateral cranial lipomatosis, ophthalmic lipodermoid, along with seizures characterized by radiological features of cortical calcification and hemiatrophy.<sup>15</sup> The hallmarks of linear nevus syndrome are typically facial nevus, recurrent refractory seizures, growth retardation with mental retardation, and unilateral ventricular dilatation resembling cerebral hemiatrophy.<sup>16</sup>

With the clinical features of cerebral hemiatrophy along with supportive radiological evidence of cerebral hemiatrophy, osseous hypertrophy of the skull, and compensatory hyperpneumatization of the sinuses, DDMS has to be considered as the cause.<sup>17-18</sup> Even though our patient had just refractory seizures and learning difficulties as the clinical features, radiographic assistance is the one that aided in the prompt diagnosis of this syndrome. Commonly affecting the pediatric population, this case is of importance since our patient is in his early adulthood.<sup>19</sup> On further examination, patient was seen to have missed the dosing of the antiepileptics leading to the onset of the above scenario, thus being the causative etiology.

Conservative management of DDMS includes rational use of antiepileptic drugs, usually in combination since they do not easily adhere to monotherapy. If seizures are refractory, cerebral hemispherectomy is the available neurosurgical option which ensures the patient is seizure-free in about 85% of the operated cases.<sup>3</sup> Long-term management also includes adjunctive usage of physiotherapy, occupational and speech therapy. At present, management of epilepsy is still limited to monotherapy or adjunct usage of antiseizure drugs as the first-line management. Prompt diagnosis and early adherence to antiepileptics as the medical management of the seizures along with rehabilitation of both neurological and physical activities are also essential.<sup>20</sup>

### Conclusion

DDMS usually presents in early childhood or adolescents as refractory seizures requiring lifelong pharmacotherapy with anticonvulsants. Due to its rarity of occurrence, it is commonly missed on initial assessment. The relatively high cost of anticonvulsants, upon the background of low socioeconomic status, personal expenses for treatment, facilitates poor adherence to the drugs and thus broadens the treatment gap.<sup>21</sup> Further studies are necessary to identify the natural course of

DDMS, especially in the adult population leading to appropriate and economical management.

## References

1. Dyke CG, Davidoff LM, Masson LB. Cerebral hemiatrophy with homolateral hypertrophy of the skull and sinus. *Surg Gynecol Obstet.* 1933;57:588-600.
2. Shetty DS, Lakhkar BN, John JR. Dyke-Davidoff-Masson syndrome. *Neurol India.* 2003 Mar;51(1):136.
3. Roy U, Panwar A, Mukherjee A, Biswas D. Adult Presentation of Dyke-Davidoff-Masson Syndrome: A Case Report. *Case Rep Neurol.* 2016 Jan 16;8(1):20-6.
4. Unal O, Tombul T, Cirak B, Anlar O, Incesu L, Kayan M. Left hemisphere and male sex dominance of cerebral hemiatrophy (Dyke-Davidoff-Masson Syndrome). *Clin Imaging.* 2004 May-Jun;28(3):163-5.
5. Afifi AK, Godersky JC, Menezes A, Smoker WR, Bell WE, Jacoby CG. Cerebral hemiatrophy, hypoplasia of internal carotid artery, and intracranial aneurysm. A rare association occurring in an infant. *Arch Neurol.* 1987 Feb;44(2):232-5.
6. Angel J Jr. Approaches to refractory epilepsy. *Ann Indian Acad Neurol.* 2014 Mar;17(Suppl 1):S12-7.
7. Sener RN, Jinkins JR. MR of craniocerebral hemiatrophy. *Clin Imaging.* 1992 Apr-Jun; 16:93-97.
8. Stred SE, Byrum CJ, Bove EL, Oliphant M. Coarctation of the midaortic arch presenting with monoparesis. *Ann Thorac Surg.* 1986 Aug;42(2):210-2.
9. Solomon GE, Hilal SK, Gold AP, Carter S. Natural history of acute hemiplegia of childhood. *Brain.* 1970 Jan 1;93(1):107-20.
10. Rao KC. Degenerative diseases and hydrocephalus; in Lee SH, Rao KC, Zimmerman RA (eds): *Cranial MRI and CT.* New York, McGraw-Hill, 1999, pp 212-214.
11. Zilkha A: CT of cerebral hemiatrophy. *Am J Roentgenol* 1980 Aug;135:259-262.
12. Thomas-Sohl KA, Vaslow DF, Maria BL. Sturge-Weber syndrome: a review. *Pediatr Neurol.* 2004 May;30(5):303-10.
13. Sheybani L, Schaller K, Seeck M: Rasmussen encephalitis: an update. *Schweiz Arch Neurol Psychiatr* 2011 Sep 7;162:225-31.
14. Qiu BP, Shi CH: Silver-Russel syndrome: a case report. *World J Pediatr* 2007;3:68-70.
15. Amor DJ, Kornberg AJ, Smith LJ. Encephalocraniocutaneous lipomatosis (Fishman syndrome): a rare neurocutaneous syndrome. *J Paediatr Child Health.* 2000 Dec;36(6):603-5.
16. Jacoby CG, Go RT, Hahn FJ. Computed tomography in cerebral hemiatrophy. *AJR Am J Roentgenol.* 1977 Jul;129(1):5-9.
17. Ono K, Komai K, Ikeda T. Dyke-Davidoff-Masson syndrome manifested by seizure in late childhood: a case report. *J Clin Neurosci.* 2003 May;10(3):367-71.
18. Aguiar PH, Liu CW, Leitão H, Issa F, Lepski G, Figueiredo EG, et al. MR and CT imaging in the Dyke-Davidoff-Masson syndrome. Report of three cases and contribution to pathogenesis and differential diagnosis. *Arq Neuropsiquiatr.* 1998 Dec;56(4):803-7.
19. Abdul Rashid AM, Md Noh MSF. Dyke-Davidoff-Masson syndrome: a case report. *BMC Neurol.* 2018 May 29;18(1):76.
20. George P, Shenoy BR. Dyke-Davidoff-Masson Syndrome: an uncommon cause of refractory epilepsy identified by neuroimaging. *Journal of Clinical and Diagnostic Research* 2011;5:833-4.
21. Narain NP, Kumar R, Narain B. Dyke-Davidoff-Masson syndrome. *Indian Pediatr.* 2008 Nov;45(11):927-8.

## Acknowledgments

We are grateful to Dr. Shashikantha Bhat (Head of Department, Internal Medicine, Adichunchanagiri Hospital and Research Centre, Karnataka, India) for his guidance and support in writing the manuscript. The authors also wish to thank Dr. Shivadarshan M. (Consultant Radiologist, Adichunchanagiri Hospital and Research Centre, Karnataka, India) for his input on the images. Also, we would like to thank Dr. Tejaswi HL (Associate professor, Department of Anatomy, Adichunchanagiri Institute of Medical Sciences, Karnataka, India) for his guidance on this case report.

## Conflict of Interest Statement & Funding

The Authors have no funding, financial relationships or conflicts of interest to disclose.

## Author Contributions

Conceptualization: GU; Data Curation: GU, HD; Resources: HD; Visualization: GU; Writing – Original Draft Preparation: GU; Writing – Review & Editing: GU, HD.

## Cite as

Urs GM, R. Doddabele H. Dyke-Davidoff-Masson Syndrome: A Case Report. *Int J Med Stud.* 2022 Jan-Mar;10(1):82-85.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://open.library.pitt.edu/)



# Eye-Opening Medical Missions

Ethan Waisberg.<sup>1</sup>

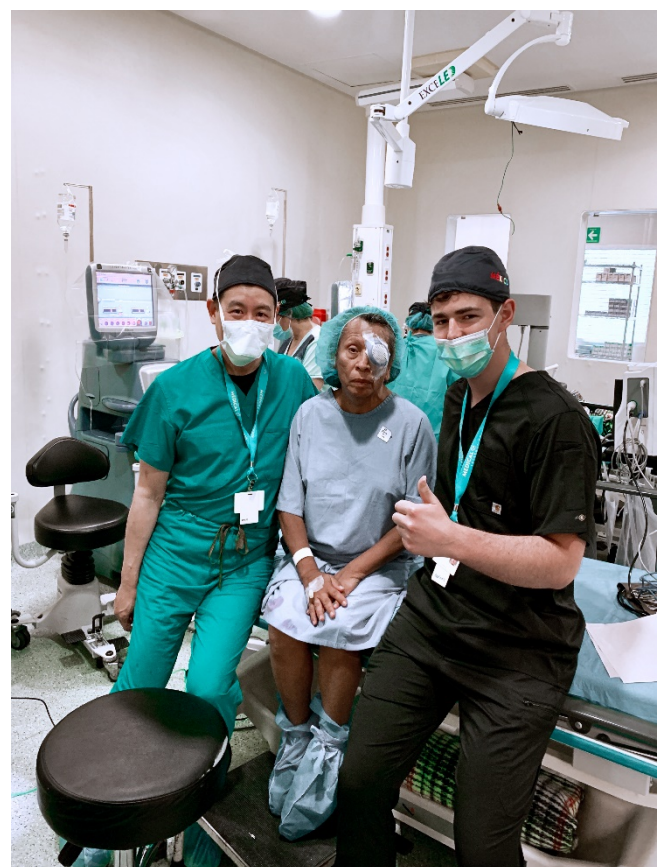
## The Experience

Before choosing a specialty, medical students should obtain clinical exposure to that area. However, how can a medical student do that when clinical placements are years away, at the end of medical education? I asked some specialists if I could shadow them during the summer, but they were too busy to do so. Moreover, the clinics and hospitals in my community that I contacted were unable to accommodate me as their observerships were restricted to upper year students or residents from specific universities. Through internet searches, I discovered that I could volunteer on medical mission trips to underserved countries, where I could gain early clinical exposure.<sup>1,2</sup> Since you must pay for your own trip and airfare, such missions can be very expensive depending on the organization. Therefore, it is important to do your own research to make an informed decision, as prices, length of stay, specialties involved, surgeries, and number of participants will vary. Some organizations offer fundraising options or tax receipts to help offset the cost. Moreover, it is prudent to research an organization's legitimacy, reputation, and long-term presence with the underserved population. Do they offer programs with lasting benefits, licensed physicians as part of the group, and preferably a charitable or not-for-profit organization? Ask people who have completed these medical mission trips about their experiences and what to expect.

Wanting to explore ophthalmology as a possible specialty, I chose an ophthalmic mission to an underserved community in Montemorelos, Mexico, run by a charitable organization called Medical Ministry International (*Figure 1*). As a Canadian citizen, I chose a mission run by a reputable Canadian charity because it fit my schedule, was just one week long in case I did not like it, was reasonably priced, and it involved a small group of ophthalmologists, most of whom had attended that trip annually for the past 10 years, proving their satisfaction. I went on this mission in the summer after my second year of medical school (a six year direct-entry program in Ireland), prior to having any formal clinical experience. The mission took place in Montemorelos, a small city in northern Mexico's orange-growing region. Our mission took place at Hospital la Carlota at the University of Montemorelos. Missions sometimes involve travel

to unsafe places so make sure you check government travel advisories and search the organization's safety record and whether they offer evacuation and health insurance. Safety was not an issue for me. Each day brought new adventures and learning opportunities. About 100 patients were brought to the hospital daily from rural villages for cataract surgery, and the mission group often operated for ten or more hours in a day. My role was to help manage patients and observe surgeries. I was fortunate to rotate among the operating rooms to observe the various surgical styles and learn from different ophthalmologists.

**Figure 1.** With a patient after a successful cataract surgery in Montemorelos, Mexico.



<sup>1</sup> MB BCh BAO student, UCD School of Medicine, University College Dublin, Belfield, Dublin 4, Ireland

**About the Author:** Ethan Waisberg is currently a fifth-year medical student of University College Dublin, Ireland of a 6-year MB BCh BAO program. He is the recipient of the University College Dublin Alfred Myles Smith Award, Finalist of the Ireland Student Medical Summit and the UCD Advantage Award.

### Correspondence:

Ethan Waisberg. <https://orcid.org/0000-0001-8999-0212>

Address: Health Sciences Centre, Belfield, Dublin, Ireland

Email: [ethanwaisberg@gmail.com](mailto:ethanwaisberg@gmail.com)

Editor: Francisco J. Bonilla-Escobar  
Student Editors: Mohamed Fahmy Doheim,  
Michael Tavolieri  
Proofreader: Ciara Egan  
Layout Editor: Lina Hemmeda

Submission: Aug 6, 2021  
Revisions: Aug 29, Oct 11, 2021  
Responses: Aug 29, Oct 27, 2021  
Acceptance: Nov 29, 2021  
Publication: Dec 13, 2021  
Process: Peer-reviewed

The doctors kindly explained things and offered to mentor me. Since none of what I observed had been taught yet at medical school, this early clinical exposure was very helpful in deciding whether this specialty suited me. Though I was not previously thinking of becoming a surgeon, this trip helped me decide that it was what I wanted. I was impressed by the life-changing impact of surgery on patients and their families.

Critics claim that medical missions are only short-term and do not develop sustainable local partnerships.<sup>3</sup> However, teams on this mission developed sustained long-term local presence by teaching local residents, doctors, and nurses at the hospital new techniques to improve surgical outcomes. They also remained available by email or telephone after leaving, should the local medical team require their advice. Most doctors on that mission have returned, some as many as ten times. One doctor has donated all the medical equipment from his multiple surgical clinics upon retirement, providing that mission hospital with state-of-the-art equipment it could not otherwise afford.

Other criticisms of medical missions are that students are under-supervised or are required to do clinical duties that are not appropriate in their own nations, or that patients get substandard care.<sup>3</sup> On this mission trip, I received and witnessed proper supervision, saw patients treated with respect and given high quality care. Others criticize missions as “voluntourism”<sup>4</sup> but in my experience, our team helped improve the health of the local population and gained important service learning. Each doctor I spoke to on the mission believed that physicians have an obligation to the medically underserved in developing countries. Critics complain that medical students should volunteer in underserved populations at home instead,<sup>5</sup> but I could find no comparable opportunity in my community for early exposure to a specialty.

This experience being so enlightening, seven months later I joined another medical mission (with the same organization, but different volunteers) in Ciénaga de Oro, Colombia (*Figure 2*). It had many more volunteers, lasted two weeks, and featured different surgeries and clinical examinations. It even provided me an opportunity to write a research article which was recently published in a peer-reviewed medical journal.<sup>6</sup>

Reflecting on these experiences, medical mission trips gave me invaluable insight into a specialty, early clinical exposure, new contacts, mentors, networking opportunities, new cultural experiences in other countries, a new language, involvement in

research and article writing, and opportunities to serve the underserved. These experiences helped me make a better-informed decision on pursuing a specialty, expanded my global outlook, and kindled a desire to pursue global health in an international elective, residency, or fellowship. I began to feel the puzzle pieces of my medical student education beginning to fall into place.

*Figure 2.* Assisting with eye exams in Ciénaga de Oro, Colombia.



Missions can greatly benefit medical students in addition to those in need. Participation is likely to benefit one's future career, making one better prepared to be a doctor. Once medical missions fully resume after COVID-19 travel restrictions are lifted, I hope to participate in many more. I highly recommend medical students participate in at least one medical mission to see for themselves. For me, this was definitely an ‘eye-opening’ experience!

## References

1. Soboka JG, Salamanca O, Calise A. My Experience with Orbis International and the Flying Eye Hospital in Ethiopia. *Int J Med Stud.* 2021;9(1):68–70.
2. Bonilla-Escobar FJ. Fighting blindness with a Guerrilla: The Guerrilla Eye Service of Pittsburgh. *Int J Med Stud.* 2017;5(3):117–120.
3. Sullivan HR. Voluntourism. *AMA J Ethics.* 2019 Sep 1;21(9):E815–822.
4. Snyder J, Dharamsi S, Crooks VA. Fly-By medical care: Conceptualizing the global and local social responsibilities of medical tourists and physician voluntourists. *Global Health.* 2011 Apr 6;7:6.

5. Stoltenberg M, Rumas N, Parsi K. Global health and service learning: lessons learned at US medical schools. *Med Educ Online*. 2012;17.
6. Waisberg E, Harvey J. Methods and findings on an ophthalmic mission trip to Colombia. *Pan Am J Ophthalmol*. 2020;2:33.

---

**Acknowledgments**

None.

**Conflict of Interest Statement & Funding**

The Authors have no funding, financial relationships or conflicts of interest to disclose.

**Author Contributions**

Writing – Original Draft, Writing – Review & Editing: EW.

**Cite as**

Waisberg, E. Eye-Opening Medical Missions. *Int J Med Stud*. 2022 Jan-Mar;10(1):86-88.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](#)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](#)

**Pitt** | Open  
Library  
Publishing



# Medical Interns as Volunteers in the COVID-19 Vaccination Drives in the Philippines

Ian Christopher N. Rocha,<sup>1,2</sup> Kimberly G. Ramos,<sup>1,3</sup> Alyssa A. Solaiman-Balt,<sup>1,4</sup> Trisha Denise D. Cedeño.<sup>1,4</sup>

## The Experience

The Philippines, with 2,434,753 confirmed cases of coronavirus disease 2019 (COVID-19) and 37,405 related deaths as of September 23, 2021, is the second worst hit Southeast Asian country.<sup>1,2</sup> With an all-time high of 26,208 single-day cases in mid-September 2021, the appearance of highly infectious variants of concern (VOC) of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), might have been a factor of the exponential increase of COVID-19 cases in the country, as is suggested in other countries.<sup>3-5</sup> In fact, the highly transmissible Delta variant is the most dominant SARS-CoV-2 variant in the country, alongside with the other VOCs such as the Alpha, Beta, and Gamma variants.<sup>6</sup> As infections continue to rise, hospitals are becoming increasingly overburdened in addition to the inadequate supply of hospital equipment and medicines due to a global shortage.<sup>7,8</sup>

**Figure 1.** Postgraduate intern (PGI) as a volunteer screener in a vaccination drive in a rural community.



In response to the rising number of COVID-19 cases, the Philippine government, through its Department of Health (DOH), has accelerated its vaccination campaign in order to achieve their target of vaccinating at least 70% of the population to achieve herd immunity, as the COVID-19 vaccine has been proven to fight the pandemic in other countries with successful vaccination responses.<sup>9-11</sup> Unfortunately, the Philippines has not yet met its goal, with only over 21% of the country's population receiving their first dose, and only 18% having full vaccination status as of September 23, 2021, since the vaccination drive started seven months prior.<sup>12</sup> Although the Philippines is expecting for more COVID-19 vaccines to arrive, ramping up the country's vaccination efforts has been very challenging since healthcare workers and those who staff the vaccination drives are continuously getting infected.<sup>13,14</sup> According to the recent DOH report dated on September 15, 2021, COVID-19 has infected 24,284 healthcare workers, resulting in 104 deaths.<sup>14</sup> Furthermore, many healthcare workers have also resigned due to decreasing quality of life brought on by work overload, mental health impacts, and protesting in the streets due to the government's failure to provide them with the promised benefits.<sup>15-17</sup>

**Figure 2.** PGIs as volunteer vaccinators in a university gymnasium (a) and a drive-thru site (b).



<sup>1</sup> MD, School of Medicine, Centro Escolar University, Manila, Philippines

<sup>2</sup> MD, Department of Medical Education and Research, University of Santo Tomas Hospital, Manila, Philippines

<sup>3</sup> MD, Professional Education, Training and Research Office, Quirino Memorial Medical Center, Quezon City, Philippines

<sup>4</sup> MD, Postgraduate Internship Program, Medical Center Manila, Manila, Philippines

**About the Author:** Ian Christopher N. Rocha, Kimberly G. Ramos, Alyssa A. Solaiman-Balt, and Trisha Denise D. Cedeño are graduates of a 4-year Doctor of Medicine degree from Centro Escolar University, Manila, Philippines. Currently, they are affiliated in different training hospitals in the National Capital Region, Philippines as postgraduate medical interns.

## Correspondence:

Ian Christopher N. Rocha. <https://orcid.org/0000-0002-8775-6876>

Address: 9 Mendiola St, San Miguel, Manila, 1008 Metro Manila, Philippines

Email: [rocha1750018@ceu.edu.ph](mailto:rocha1750018@ceu.edu.ph)

Editor: Francisco J. Bonilla-Escobar  
Student Editors: Nguyen Tran Minh Duc  
& Leah Komer

Copyeditor: Madeleine Jemima Cox  
Proofreader: Adnan Mujanovic  
Layout Editor: Sajjad Ali

Submission: Sep 30, 2021  
Revisions: Oct 23, 2021  
Responses: Oct 31, 2021  
Acceptance: Nov 3, 2021  
Publication: Nov 3, 2021  
Process: Peer-reviewed

Faced with this challenging problem of manning vaccination drives due to inadequate healthcare workforce, the DOH has requested volunteers, including the postgraduate interns (PGIs) who recently finished their medical degree, to volunteer as screeners, encoders, vaccinators, and health educators, with the approval from the Commission on Higher Education and the directors of their affiliated training hospitals. To encourage them to volunteer in the vaccination drives nationwide, the PGIs are given proper credits in their community and elective rotations.<sup>18</sup> With guided supervision by licensed physicians, their voluntary work and community exposure are also part of their medical training since several of them completed their clinical clerkships online with little to no practical experience due to the pandemic's impact on education in the Philippines.<sup>19,20</sup>

**Figure 3.** PGIs as volunteers in one of the vaccination drives in the Philippines.



During the vaccination drives, the PGIs are responsible in manning the different areas such as the waiting room, registration, health screening, health education, vaccine administration, and observation areas, respectively (*Figures 1-4*). During this time, PGIs can hone their skills in history taking by asking patients questions about their health, including current medications being taken, history of vaccination, exposure to COVID-19, and allergies. Furthermore, they can practice and enhance their instructional and interpersonal skills while acting as health educators and playing a key role in the administration of vaccines among others. Indeed, as future healthcare professionals, PGIs are regarded as those with closest capability to take part in battling the current pandemic.<sup>21</sup> While it is true that the current pandemic has hindered the implementation of conventional medical education, it is also without a doubt that this pandemic emphasized the need for global health and disaster preparedness, an enormous learning opportunity to develop skills on multidisciplinary preparedness, health information management, emergency decision making, and

leadership during crisis, in addition to the basic medical knowledge and clinical competencies for PGIs.

**Figure 4.** PGIs as volunteers during a COVID-19 vaccination drive for the pediatric population in Manila, Philippines.



Through this initiative, volunteer PGIs were able to acquire valuable experience by performing in a real-life setting, gaining practical hands-on knowledge, and making a significant impact in the lives of people in the community by sharing their knowledge and skills and fulfilling their mission to heal and serve mankind while learning more about healthcare conditions in the Philippines. The PGIs were quick to rise up to the challenge as they signed up for vaccination drives to join the medical community in their fight against COVID-19. Many countries have also taken similar steps, such as recruiting volunteers to assist with their mass vaccination rollouts.<sup>10,22-25</sup> This initiative can be emulated by other countries with inadequate healthcare workforce in order to speed up their vaccination efforts.

### Summary - Accelerating Translation

Sa pagnanais at pagsusumikap ng gobyerno ng Pilipinas na makamit ang herd immunity laban sa COVID-19, nanawagan ang Kagawaran ng Kalusugan sa mga postgraduate interns, na nakapagtapos ng kanilang degree sa medisina, na makilahok sa mga programang pagbabakuna bilang bahagi ng kanilang mga rotation sa komunidad at electives, habang ginagabayan at pinangangasiwaan ng mga lisensyadong manggagamot. Sa pamamagitan ng inisyatibong ito, ang mga boluntaryong postgraduate interns ay nagkaroon ng pagkakataong makapagkamit ng makabuluhang karanasan sa pamamagitan ng aktuwal na pagtatrabaho, pagkakaroon ng praktikal na kaalaman, at pag-iiwan ng mahalagang bagay sa buhay ng mga tao sa komunidad sa pamamagitan ng pagbabahagi ng kanilang kaalaman at kasanayan at pagtupad sa kanilang misyon na pagalingin at paglingkuran ang sangkatauhan habang patuloy na natutuhan ang mga kondisyon ng pangangalagang pangkalusugan sa Pilipinas.

### References

1. Department of Health. COVID-19 tracker. Available from: <https://doh.gov.ph/covid19tracker>; updated 2021 Sep 23; cited 2021 Sep 23.
2. Miranda AV, Wiyono L, Rocha ICN, Cedeño TDD, Lucero-Prisno DE. Strengthening virology research in the Association of Southeast Asian Nations: preparing for future pandemics. *Am J Trop Med Hyg.* 2021. doi: 10.4269/ajtmh.21-0589. Epub ahead of print.

3. Rocha ICN, Goyal S, Rackimuthu S, Jain S. SARS-CoV-2 variants of concern: implications on the second wave of COVID-19 in India. *Infez Med.* 2021;29(3):492-494. doi: 10.53854/liim-2903-22.
4. Jindal H, Jain S, Suvvari TK, Kutikuppala LVS, Rackimuthu S, Rocha ICN, et al. False-negative RT-PCR findings and double mutant variant as factors of an overwhelming second wave of COVID-19 in India: an emerging global health disaster. *SN Compr Clin Med.* 2021. doi: 10.1007/s42399-021-01059-z. Epub ahead of print.
5. Hasan MM, Rocha ICN, Ramos KG, Cedeño TDD, Dos Santos Costa AC, Tsagkaris C, et al. Emergence of highly infectious SARS-CoV-2 variants in Bangladesh: the need for systematic genetic surveillance as a public health strategy. *Trop Med Health.* 2021;49(1):69. doi: 10.1186/s41182-021-00360-w.
6. Magsambol B. Delta now dominant COVID-19 variant in the Philippines - WHO. *Rappler.* Available from: <https://www.rappler.com/nation/who-says-delta-now-dominant-covid-19-variant-philippines-august-31-2021>; published 2021 Aug 31; cited 2021 Sep 23.
7. Ramos KG, Rocha ICN, Cedeño TDD, Dos Santos Costa AC, Ahmad S, Essar MY, et al. Suez Canal blockage and its global impact on healthcare amidst the COVID-19 pandemic. *Int Marit Health.* 2021;72(2):145-146. doi: 10.5603/IMH.2021.0026.
8. Dapke K, Phadke R, Rocha ICN, Dos Santos Costa AC, Ahmad S, Essar MY, et al. Drug supply shortage in India during COVID-19 pandemic: efforts and challenges. *Harvard Public Health Review.* 2021;31. Epub ahead of print.
9. Rocha ICN. How to avoid fake COVID-19 vaccine passports as a travel requirement? *J Public Health (Oxf).* 2021. doi: 10.1093/pubmed/fdab308. Epub ahead of print.
10. Rocha ICN. Employing medical anthropology approach as an additional public health strategy in promoting COVID-19 vaccine acceptance in Bhutan. *Int J Health Plann Manage.* 2021;36(5):1943-1946. doi: 10.1002/hpm.3191.
11. Lin X, Rocha ICN, Shen X, Ahmadi A, Lucero-Priso DE. Challenges and strategies in controlling COVID-19 in mainland China: lessons for future public health emergencies. *J Social Health.* 2021;4(2):57-61.
12. Department of Health. National COVID-19 vaccination dashboard. Available from: <https://doh.gov.ph/covid19-vaccination-dashboard/>; updated 2021 Sep 23; cited 2021 Sep 23.
13. Dalan AC. PH receives 64.9M vax doses, records highest weekly delivery. *Philippine News Agency.* Available from: <https://www.pna.gov.ph/articles/1154122>; published 2021 Sep 21; cited 2021 Sep 24.
14. Gonzales C. 104 health workers die of COVID-19 - DOH data. *Rappler.* Available from: <https://newsinfo.inquirer.net/1488095/104-health-workers-die-of-covid-19-doh-data>; published 2021 Sep 15; cited 2021 Sep 23.
15. Rocha ICN, Arcinas MM. Quality of life of Filipino caregivers of children in need of special protection: correlations with their role overload and role distress. *J Caring Sci.* 2020;9(4):173-181. doi: 10.34172/jcs.2020.027.
16. Rocha ICN, Dos Santos Costa AC, Islam Z, Jain S, Goyal S, Mohanan P, et al. Typhoons during the COVID-19 pandemic in the Philippines: impact of double crises on mental health. *Disaster Med Public Health Prep.* 2021. doi: 10.1017/dmp.2021.140. Epub ahead of print.
17. Portugal A. Philippines health workers protest neglect as COVID-19 strains hospitals. *Reuters.* Available from: <https://www.reuters.com/world/asia-pacific/philippines-health-workers-protest-neglect-covid-19-strains-hospitals-2021-09-01/>; published 2021 Sep 1; cited 2021 Sep 24.
18. Association of Philippine Medical Colleges. Call for volunteer vaccinators. Available from: [bit.ly/APMCI-Advisory-08182021](http://bit.ly/APMCI-Advisory-08182021); published 2021 Aug 18; cited 2021 Sep 24.
19. Cedeño TDD, Rocha ICN, Ramos KG, Uy NMC. Learning strategies and innovations among medical students in the Philippines during the COVID-19 pandemic. *Int J Med Stud.* 2021;9(1): 77-79. doi: 10.5195/ijms.2021.908.
20. Cleofas JV, Rocha ICN. Demographic, gadget and internet profiles as determinants of disease and consequence related COVID-19 anxiety among Filipino college students. *Educ Inf Technol (Dordr).* 2021;26: 6771-6786. doi: 10.1007/s10639-021-10529-9.
21. Ashcroft J, Byrne MHV, Brennan PA, Davies RJ, Davies RJ. Preparing medical students for a pandemic: a systematic review of student disaster training programmes. *Postgrad Med J.* 2020;97(1148):368-379. doi: 10.1136/postgradmedj-2020-137906.
22. Lan TT, Khanh VT, Minh Dic NT. COVID-19 volunteering experience in Vietnam. *Int J Med Stud.* 2021; 9(3):235-236.
23. Rohman M. Medical student volunteers administer COVID-19 vaccines. *Northwestern University News Center.* Available from: <https://news.feinberg.northwestern.edu/2021/05/medical-student-volunteers-administer-covid-19-vaccines/>; published 2021 May 11; cited 2021 Oct 31.
24. Barrish C. Putting shots in arms, nurse volunteers are backbone of Delaware mass vaccination events. *Why.* Available from: <https://why.org/articles/putting-shots-in-arms-nurse-volunteers-are-backbone-of-delaware-mass-vaccination-events/>; published 2021 Apr 16; cited 2021 Oct 31.
25. Tang T, Valdes M. Volunteers are key at vaccine sites. It pays off with a shot. *AP News.* Available from: <https://apnews.com/article/volunteers-coronavirus-vaccine-sites-5dcef04d8b6fd33cd287ac3ab3e26137>; published 2021 Mar 10; cited 2021 Oct 31.

### Acknowledgments

None

### Conflict of Interest Statement & Funding

The Authors have no funding, financial relationships or conflicts of interest to disclose.

### Author Contributions

Conceptualization: ICNR, KGR, AASB, TDDC; Project administration: ICNR; Supervision: ICNR; Visualization: ICNR, KGR, AASB, TDDC; Writing – Original Draft Preparation: ICNR, KGR; Writing – Review & Editing: ICNR, KGR, AASB, TDDC.

### Cite as

Rocha ICN, Ramos KG, Solaiman-Balt AA, Cedeño TDD. Medical Interns as Volunteers in the COVID-19 Vaccination Drives in the Philippines. *Int J Med Stud.* 2022 Jan-Mar;10(1):89-91.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://open.library.pitt.edu/)



# Experience in a Palliative Care Unit in a Mexican Tertiary Level Hospital.

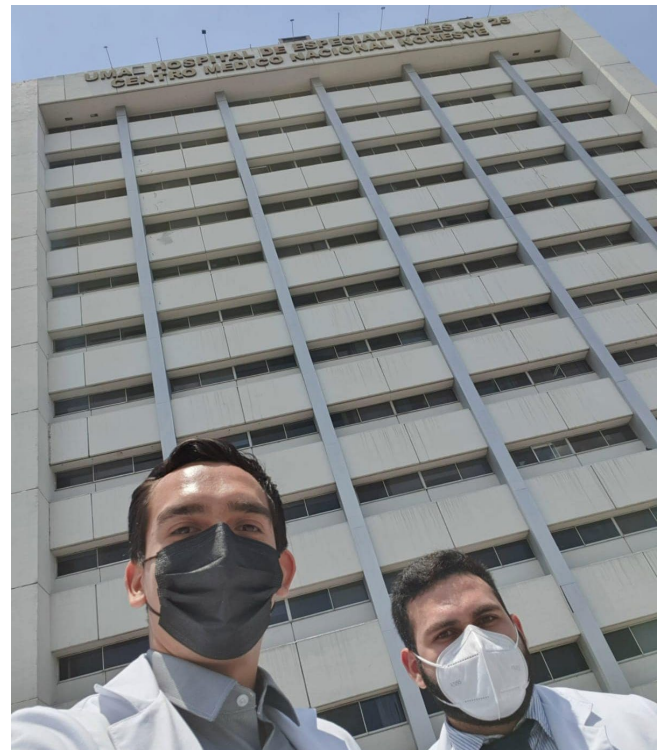
Patricio García-Espinosa.<sup>1,2</sup>

## The Experience

I have recently started to develop myself in a role of a medical intern performing my social service year in one of the largest medical units in the north of Mexico, the "Unidad Médica de Alta Especialidad #25" (High Specialty Medical Unit #25). As a highly specialized tertiary-level center, it is the second largest hospital in metropolitan area of Mexico. In this exact institution I have chosen an internship on the palliative care ward, being the first time that this position has been open for undergraduate physicians. It has been an amazing experience, after which I have given myself the task of reflecting on what I have done so far. Firstly, I have had contact with patients to whom I had not had the opportunity to provide care during my previous years of training. At the same time, I have handled medications such as opioids, to which I had not had access before. Additionally, I have reinforced the practice of delivering bad news, always accompanied, and instructed, by attending physicians and by last year residents of anesthesiology, geriatrics and family medicine who rotate through this unit. These residents can perform the sub-specialty of pain management and palliative care in Mexico, which is why they do part of their fellowship rotations on this ward. In international literature, there is much talk about the role we, undergraduate students, play as part of the palliative care team. This has been pointed out in case of nursing education by Dimoula, M et al.<sup>1</sup> which showed that structured undergraduate palliative care courses could be a core element in the healthcare system. In addition, Oliveria, S. et al.<sup>2</sup> in 2020 at the University of Coimbra, emphasized that, despite agreeing with the importance of palliative care, fifth year medical students did not feel properly trained, nor had sufficient knowledge about this subject.

Weber, M. et al.<sup>3</sup> has described in Germany, that undergraduate medical students felt limited in their confidence when approaching palliative medicine. At the same time, they emphasize the limited knowledge of the subject, concluding that its introduction in the curricula of undergraduate students is necessary.

Figure 1. A New Experience.



**Legend:** The UMAE #25 in the background, with the interns of the palliative care unit, Alejandro Saénz (left) and Patricio García-Espinosa (right).

Surprisingly for me, there is in fact, a study emulating the perception of medical students towards palliative care in Mexico. More precisely, students at the highest ranking national university, the "Universidad Nacional Autónoma de México", conducted a study in 2020 by Allende-Pérez S. et al.<sup>4</sup> It revealed not only the perception on the lack of skills of undergraduate physicians, but also their inability to cope with given scenarios in palliative care settings, their interest in making this a compulsory course, and finally their dissatisfaction because it is not included in their current medical curriculum.

<sup>1</sup> School of Medicine, Universidad Autónoma de Nuevo León, Monterrey. México.

<sup>2</sup> Mexican Institute of Social Security. Palliative Care Unit. High Specialty Medical Unit #25, Nuevo León, Monterrey. México.

**About the Author:** *García-Espinosa, Patricio. He is currently a medical intern in his social service year at the Mexican Social Security Institute (IMSS).*

### Correspondence:

Patricio García-Espinosa. <https://orcid.org/0000-0002-8139-806X>

Address: School of Medicine, Universidad Autónoma de Nuevo León, Monterrey. México.

Email: [patricio.garciaes@uanl.edu.mx](mailto:patricio.garciaes@uanl.edu.mx)

Editor: Francisco J. Bonilla-Escobar  
Student Editors: Shuo-Yan Gau, Manas Pustake,  
Nikoleta Tellios, Leah Komer, Vinson Chan  
Copyeditor: Adnan Mujanovic  
Proofreader: Michael Tavolieri  
Layout Editor: Sushil Dahal

Submission: Aug 3, 2021  
Revisions: Aug 25, Oct 1, 2021  
Responses: Aug 25, Oct 26 2021  
Acceptance: Nov 3, 2021  
Publication: Nov 3, 2021  
Process: Peer-reviewed

I began my studies in palliative care in the sixth semester (third year of medical school), which was more than 3 years ago.

During this time, I have learned that palliative care has the goal of focusing on improving patients' life quality at its end-stage, providing them with freedom, dignity, and greater autonomy in their final moments through the relief of symptoms such as pain, dyspnea, and delirium. In case of refraction, palliative sedation may even be indicated.

Relief of symptomatology, limiting therapeutic obstinacy, and focusing on human dignity, were the reason why I decided to perform my social service year in the palliative care unit.

I have seen that there are physicians who are reluctant to limit efforts of medical care, especially pediatricians, because they consider that, unlike adult patients, pediatric patients have not lived their fullest lives yet. However, there have been situations where therapeutic obstinacy is highly present. For example, in a setting of starting chemotherapy in patients with advanced disease progression, without the possibility of curative treatment, I have observed a patient cases of bilateral Wilms tumor, and acute myeloid leukemia. The death of the patients was inevitable and there were problems in communication between treating services and family members, making the process even more complicated.

On the other hand, I have seen the sadness of a mother when she is told that her daughter's or son's time to go has come, and that this process can be made easier for them with adequate communication, showing signs of gratitude.

It is important to have a good support network, and that the caregiver must also be cared for to avoid burn-out.

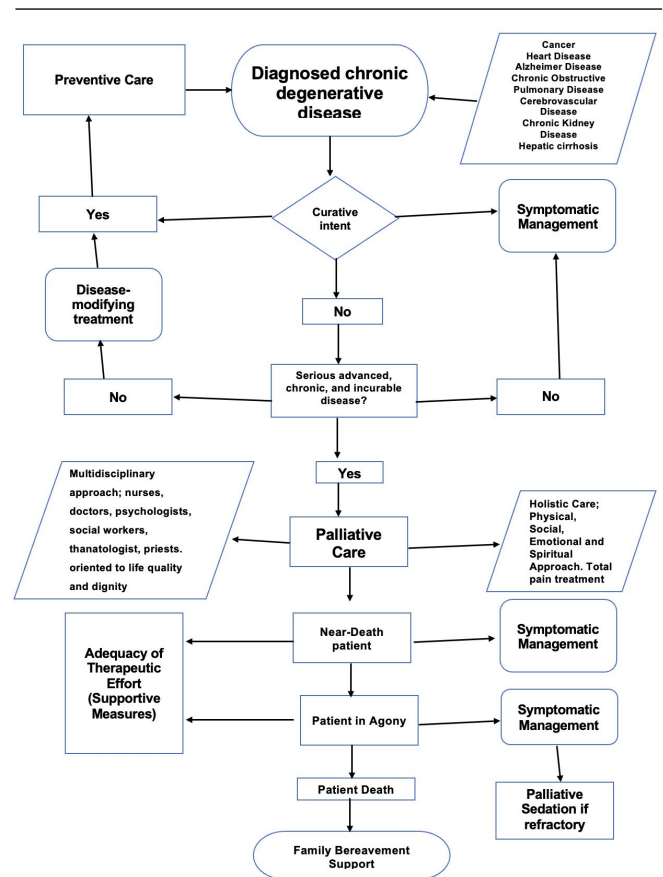
Being part of the first generation to be allowed to rotate in the pain management and palliative care unit has been an experience that has allowed me to learn and see things that we, as undergraduates, sometimes avoid. Unique end-of-life medical care, has led me to agree with the previously cited authors.<sup>1,2,3,4</sup>

It is necessary to be interested in seeking, learning, and understanding palliative care as undergraduate students, and not only the curative medical approach. For example, the case of a 46-year-old male patient, who had not been able to sit up since his diagnosis of rectal cancer 3 years ago, due to the pain it caused him, has underwent lysis of cauda equina and after 2 weeks the patient reported 2/10 pain score, and improvement in his quality of life, calling it a "miracle of science". It is important to emphasize that opioids are wonderful drugs and that we should not be afraid of their use; on the contrary, it is important to highlight their capacity to alleviate the pain and suffering of a patient and even of a family. *Figure 1* shows the first interns in this service.

**Final Reflection**

I would like to emphasize the words of De Antueno and Silberberg in 2018.<sup>5</sup> One of the situations that will be responsible for producing greater suffering in life, is precisely the disease, which is accompanied by biological, social, and psychological factors. When curative treatment is no longer an option, there is always something left for the medical team to do; such as initiating palliative care (*Figure 2*). I must emphasize that research in this area is still scarce, and that the more research and improvement is being made, the more can be done to improve end-of-life care quality. Death of a patient, after all, is a collaborative work between the general physician, the nurse who is also often a thanatologist, and finally, most importantly, the family.

*Figure 2.* Palliative Care Flowchart.



**Summary - Accelerating Translation**

**Título:** Experiencia en una Unidad de Cuidados Paliativos en un Hospital Mexicano de Tercer Nivel

**Problema Principal:** El rol olvidado en la licenciatura de medicina del cuidado de los pacientes que cursan la última etapa de la vida y se aproximan al final de esta y cuya función es de los cuidados paliativos.

**Propósito:** A través de la presente experiencia, busque el exponer el rol de los cuidados paliativos en un hospital de alta especialidad en la segunda ciudad metropolitana más grande de México en el papel de un Médico Pasante del Servicio Social.

**Metodología:** Se expone la experiencia en los cuidados paliativos tanto del adulto como del paciente pediátrico, se realiza un acercamiento al rol del

médico paliativista en el manejo de la sintomatología y los problemas que se puede atravesar al momento de llevar a cabo la función propia de una especialidad que se encuentra en un crecimiento reciente en el contexto mexicano.

**Resultados:** Acercamiento del rol del médico paliativista y la multidisciplinariedad que significa esta disciplina; un acercamiento al rol que se tiene como Médico Pasante del Servicio Social del sistema de salud mexicano y la colaboración entre residentes de último año que pueden optar por la subespecialidad en cuidados paliativos, incluyendo residentes de Medicina Familiar, Geriátrica y Anestesiología (otros residentes que pueden optar a la subespecialidad son los oncólogos, pero no está regulado en el Instituto Mexicano del Seguro Social); se hace especial énfasis en la falta de práctica en el pregrado de medicina alrededor de los cuidados paliativos, la importancia de

la comprensión de los conceptos de limitación del esfuerzo terapéutico y la necesidad de evitar la obstinación terapéutica, principalmente en pediatría.

**Conclusión:** Se encuentra como una necesidad imperiosa, el exponer los cuidados paliativos como medidas deseables, además de incentivar la producción académica en el campo del conocimiento y la investigación en los estudiantes de pregrado de medicina, no solamente incentivar el enfoque curativo de la medicina; además de concientizar sobre el correcto uso de analgésicos opioides en busca de aumentar la calidad de vida del paciente y su familia, además de aliviar el sufrimiento en las esferas biológicas, psicológicas, sociales y espirituales, con un enfoque multidisciplinario.

## References

1. Dimoula M, Kotronoulas G, Katsaragakis S, Christou M, Sgourou S, Patiraki E. Undergraduate nursing students' knowledge about palliative care and attitudes towards end-of-life care: A three-cohort, cross-sectional survey. *Nurse Educ Today*. 2019 Mar;74:7-14.
2. Oliveira S, Santiago LM, Dourado M. Conhecimento sobre Cuidados Paliativos em Estudantes de Medicina da Universidade de Coimbra [Knowledge of Palliative Care Among Medical Students of the University of Coimbra]. *Acta Med Port*. 2020 Aug 27. Portuguese
3. Weber M, Schmiedel S, Nauck F, Alt-Epping B. Knowledge and attitude of final - year medical students in Germany towards palliative care - an interinstitutional questionnaire-based study. *BMC Palliat Care*. 2011 Nov 23;10:19.
4. Allende-Pérez, Silvia, et al. [Basic knowledge and perceptions in palliative care in undergraduate physicians at the National Autonomous University of Mexico: a cross-sectional study]. *Med. Paliat*. 2020Apr-Jun;71-78.Spanish
5. de Antueno P, Silberberg A. [Efficacy of Palliative Care in Pain Relieving]. 2019 Jun;22(2):367-80. Spanish

## Acknowledgments

None.

## Conflict of Interest Statement & Funding

The Authors have no funding, financial relationships or conflicts of interest to disclose.

## Author Contributions

Conceptualization, Data Curation, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Resources, Software, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing: PG.

## Cite as

García-Espinosa, P. Experience in a Palliative Care Unit in a Mexican Tertiary Level Hospital. *Int J Med Stud*. 2022 Jan-Mar;10(1):92-94.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://pittopenlibrarypublishing.com/)



# A Medical Student's Perspective on the Growing Importance of Telemedicine/Telerehabilitation

Sung-Hoon Park,<sup>1</sup> Nuray Yozbatiran.<sup>2</sup>

## The Experience

According to the National Institute of Health (NIH), telemedicine is defined as "the use of electronic information and communications technologies to provide and support health care when distance separates the participants."<sup>1</sup> Although telemedicine was introduced over 60 years ago, the technological revolution of the 21<sup>st</sup> century has allowed telemedicine to evolve into a standard tool for physicians.<sup>2</sup> The emergence of the COVID-19 pandemic further increased the demand for telemedicine rapidly, particularly telerehabilitation for those with chronic conditions<sup>3</sup> such as spinal cord injury (SCI).

According to the National Spinal Cord Injury Statistical Center (NSCISC), there are approximately 296,000 people in the United States living with SCI as of 2020.<sup>4</sup> Rehabilitation programs aiming to improve motor functions after SCI are important in reducing disability, promoting independence, and alleviating burden on caretakers. There is evidence that treatment intensity has a profound effect on motor recovery. High-dosage, high-intensity repetitive training of arm movements or functional tasks can provide better functional outcomes.<sup>5</sup>

An appropriate intervention requires periodic access to a location with appropriate equipment as well as a therapist to facilitate a one-on-one session to improve upper limb functions.<sup>6</sup> However, access to appropriate rehabilitation interventions is unfortunately limited due to cost, shortage of regional rehabilitation care, difficulty in traveling to the location where the therapy is provided, and poor adherence with assignments.<sup>7-9</sup> This situation has called for an increase in home-based telerehabilitation interventions, i.e., "the remote delivery of rehabilitation and home health care services,"<sup>10</sup> in order to increase access to appropriate interventions to improve upper limb functions.

## Experience with Telerehabilitation

I was fortunate to work at the summer research program in the

Department of Physical Medicine and Rehabilitation at McGovern Medical School, NeuroRecovery Research Center at TIRR Memorial Hermann. As part of the program, I assisted in the development and delivery of telerehabilitation interventions for 36 individuals with chronic incomplete cervical SCI to test its feasibility. The research project consisted of combining non-invasive brain stimulation via transcranial direct current stimulation (tDCS) and high-intensity repetitive arm/hand and finger exercises.

Preparing for the intervention was relatively time-consuming and difficult compared to conventional in-person interventions. We had to ensure that all safety criteria were met, namely, safe delivery of tDCS in a virtual setting. All observed patients had minimal fine upper motor function and were not able to operate the computer nor equipment for the telerehabilitation session without aid. Thus, for each patient, their caregiver was trained for proper set-up of tDCS electrodes on the head and delivery of stimulation, as well as donning and doffing of exercise equipment and operating exercise programs on the provided laptop. Due to the large age range and different skill levels in using technology between participants and caregivers, we also needed to ensure that they were trained properly. The training consisted of in-person training at the research center during the in-person baseline assessment session. Additionally, an instruction manual for tDCS and exercise equipment was provided to use at home. Conventional in-person interventions do not require such extensive preparations prior to treatment sessions, but it is far more inconvenient for patients and is inflexible to emergencies that may arise.

When the treatment sessions lasted longer than expected, the patient was able to begin preparing for lunch during the breaks of the interventions. Patients were able to take restroom breaks or eat snacks from the convenience of their home. Patients were also able to travel and participate in the treatment sessions from

<sup>1</sup> BSA. The University of Texas Health Science Center at Houston, McGovern Medical School, Houston; Neuromodulation and Neural Interfaces Laboratory, Neurorecovery Research Center at TIRR Memorial Herman, Houston, TX, United States.

<sup>2</sup> PhD, PT. Neuromodulation and Neural Interfaces Laboratory, Neurorecovery Research Center at TIRR Memorial Herman, Houston; Department of Physical Medicine and Rehabilitation, The University of Texas Health Science Center at Houston, Houston, TX, United States.

**About the Author:** Sung-Hoon Park is currently a 2<sup>nd</sup> year medical student at McGovern Medical School in Houston, Texas of the United States of America. He is a recipient of Albert Schweitzer Fellowship and Summer Research Program Fellowship.

## Correspondence:

Nuray Yozbatiran. <https://orcid.org/0000-0002-6765-2455>

Address: 7000 Fannin St #1200, Houston, TX 77030, United States

Email: [nuray.yozbatiran@uth.tmc.edu](mailto:nuray.yozbatiran@uth.tmc.edu)

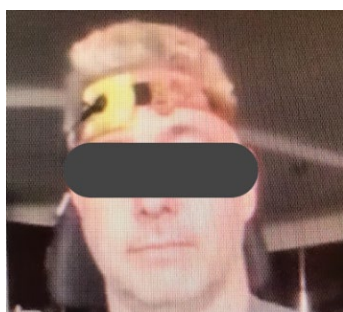
Editor: Francisco J. Bonilla-Escobar  
Student Editors: Michael Tavolieri, L V  
Simhachalam Kutikuppala, & Johnmark Boachie  
Copyeditor: Benjamin Liu  
Proofreader: Nikoleta Tellios  
Layout Editor: Francisco J. Bonilla-Escobar

Submission: Jul 23, 2021  
Revisions: Oct 11, 2021  
Responses: Nov 11, 2021  
Acceptance: Nov 14, 2021  
Publication: Nov 23, 2021  
Process: Peer-reviewed

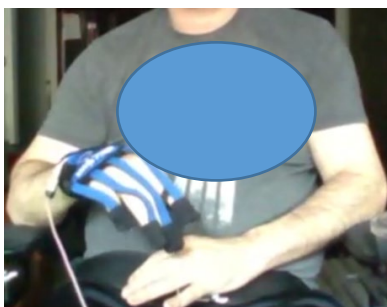
anywhere they please. Furthermore, patients were pleased with being able to keep wearing their cozy home clothes as well as having some time flexibility. Telerehabilitation also allowed many patients living hours away from TIRR Memorial Hermann to receive the intervention. Some recruited patients lived an hour or further away from the clinic but were able to participate due to the virtual setting of the treatment. Furthermore, as all observed patients were unable to drive, if the treatment sessions were in-person, they would have required a caregiver to transport them

for each session, which is a difficult process as a quadriplegic. Many patients also have different caregivers for driving and home care. By having the treatment sessions virtually, patients can decrease their need and cost for a driving caregiver. One patient in the study stated how convenient telerehabilitation was compared to in-person sessions, especially as a quadriplegic. Receiving telerehabilitation allowed the patient to save travel time and perform the intervention exercises at the convenience of their home (*Figure 1*).

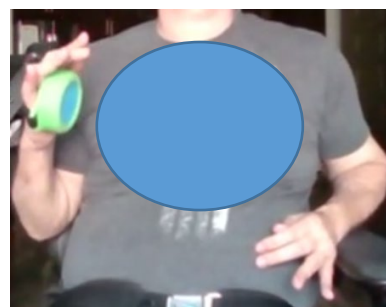
**Figure 1.** Image of a Patient with tDCS and the 2-Exercise Equipment in a Real-Time, remotely Supervised Treatment Session.



1x1 electrode montage for stimulating M1 area with tDCS



Repetitive Finger Exercises



Repetitive Arm/Hand Exercises

Telerehabilitation was convenient and flexible from the clinician point of view. Once the extensive preparation was completed, the intervention sessions were very simple, only needing to log onto WebEx/Zoom, provide instructions, and record data. The flexibility of telerehabilitation allowed us to tend to unforeseen circumstances without having to cancel treatment sessions. For instance, my father was exposed to an individual with COVID infection, which prevented me from coming into the research center until I was cleared for a negative COVID test. However, I was still able to attend the interventions via WebEx/Zoom.

### Discussion and Future Development

It is likely that telemedicine will continue to evolve and be used more widely even after the pandemic, owing to its capability of providing care from the convenience of the patient's home as well as increase access to healthcare efficiently and cost-effectively.<sup>11</sup> I see the potential that telerehabilitation and telemedicine has to be as a big part of my future as a physician. In fact, I believe that telemedicine should be part of the medical school curriculum. Each specialty within medicine could develop a standardized curriculum for telemedicine use. Perhaps, medical students' clinical rotations could include telemedicine for practice.

For telemedicine to evolve into its full potential, the following improvements must be made. There must be a development of

standardized guidelines for physicians, therapists, patients, and caregivers. Similar to the medical school curriculum, there should be standardized guidelines for each specialty. The standardization will allow the telerehabilitation sessions to be orderly and efficient regardless of the illness or other variables. There are a few published telerehabilitation guidelines. However, many are outdated.<sup>12,13</sup> The newer guidelines lack movement-related information and are not useful for those with physical disabilities such as those with quadriplegia from spinal cord injuries.<sup>14</sup> Another improvement is to further develop equipment with the purpose of telerehabilitation in mind. As of today, very few treatment devices have been designed with telerehabilitation in mind, and those that do generally have a very narrow window for application.<sup>15-17</sup> For instance, the two upper limb rehabilitation interventions used for the study cannot be calibrated nor personalized for each patient, making it less useful for certain patients over others.

Telemedicine is an exciting evolution within medicine that could greatly aid in increased access as well as reduced cost to healthcare. I look forward to seeing how it continuously evolves in the field of medicine.

### References

1. Fiel MJ. Telemedicine: A Guide to Assessing Telecommunications in Health Care. National Academies Press; 1996.
2. Breen G-M, Matusitz J. An Evolutionary Examination of Telemedicine: A Health and Computer-Mediated Communication Perspective. *Social Work in Public Health*. 2010 Jan;25(1):59-71.



3. Bernell S, Howard SW. Use Your Words Carefully: What Is a Chronic Disease?. *Front Public Health*. 2016;4:159.
4. Spinal Cord Injury Facts and Figures at a Glance [Internet]. [cited 2021Jul22]. Available from: <https://www.nscisc.uab.edu/Public/Facts%20and%20Figures%20-%202021.pdf>
5. Francisco GE, Yozbatiran N, Berliner J, O'Malley MK, Pehlivan AU, Kadivar Z, et al. Robot-Assisted Training of Arm and Hand Movement Shows Functional Improvements for Incomplete Cervical Spinal Cord Injury. *American Journal of Physical Medicine & Rehabilitation*. 2017;96(10).
6. Friedman N, Chan V, Reinkensmeyer AN, Beroukhim A, Zambrano GJ, Bachman M, et al. Retraining and assessing hand movement after stroke using the MusicGlove: comparison with conventional hand therapy and isometric grip training. *Journal of NeuroEngineering and Rehabilitation*. 2014;11(1):76.
7. Lang CE, MacDonald JR, Reisman DS, Boyd L, Jacobson Kimberley T, Schindler-Ivens SM, et al. Observation of Amounts of Movement Practice Provided During Stroke Rehabilitation. *Archives of Physical Medicine and Rehabilitation*. 2009;90(10):1692–8.
8. Byl NN, Pitsch EA, Abrams GM. Functional Outcomes Can Vary by Dose: Learning-Based Sensorimotor Training for Patients Stable Poststroke. *Neurorehabilitation and Neural Repair*. 2008;22(5):494–504.
9. Jeffers MS, Karthikeyan S, Gomez-Smith M, Gasinzigwa S, Achenbach J, Feiten A, et al. Does Stroke Rehabilitation Really Matter? Part B: An Algorithm for Prescribing an Effective Intensity of Rehabilitation. *Neurorehabilitation and Neural Repair*. 2018;32(1):73–83.
10. Seelman KD, Hartman LM. Telerehabilitation: Policy Issues and Research Tools. *International Journal of Telerehabilitation*. 2009:47–58.
11. Kichloo A, Albosta M, Dettloff K, Wani F, El-Amir Z, Singh J, et al. Telemedicine, the current COVID-19 pandemic and the future: a narrative review and perspectives moving forward in the USA. *Family Medicine and Community Health*. 2020;8(3).
12. Brennan D, Tindall L, Theodoros D, et al. A blueprint for telerehabilitation guidelines. *International Journal of Telerehabilitation*. 2010;2(2):31–34.
13. Amatya B, Galea MP, Kesselring J, Khan F. Effectiveness of telerehabilitation interventions in persons with multiple sclerosis: A systematic review. *Multiple Sclerosis and Related Disorders*. 2015;4(4):358–69.
14. Anil K, Freeman JA, Buckingham S, Demain S, Gunn H, Jones RB, et al. Scope, context and quality of Telerehabilitation Guidelines for physical disabilities: A scoping review. *BMJ Open*. 2021;11(8).
15. Dedov VN, Dedova IV. Development of the internet-enabled system for exercise telerehabilitation and cardiovascular training. *Telemedicine and e-Health*. 2015;21(7):575–80.
16. Finkelstein J, In Cheol Jeong. Remotely controlled cycling exercise system for home-based telerehabilitation. 2013 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). 2013.
17. Tsai LL, McNamara RJ, Dennis SM, Moddel C, Alison JA, McKenzie DK, et al. Satisfaction and experience with a supervised home-based real-time videoconferencing telerehabilitation exercise program in people with chronic obstructive pulmonary disease (COPD). *International Journal of Telerehabilitation*. 2016;8(2):27–38.

### Acknowledgments

We acknowledge our subjects and caregivers for their valuable participation.

### Conflict of Interest Statement & Funding

This project was supported by Mission Connect, a project of TIRR Foundation (NY); UTHealth Department of PM&R; and Deans Contribution Funds from McGovern Medical School.

### Author Contributions

Conceptualization: NY. Writing – Original Draft Preparation & Writing – Review & Editing: SHP & NY.

### Cite as

Park S-H, Yozbatiran N. A Medical Student's Perspective on the Growing Importance of Telemedicine/Telerehabilitation. *Int J Med Stud*. 2022 Jan-Mar;10(1):95–97.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://open.library.pitt.edu/)



# The Student Dermatology Clinic for the Underserved: A Service-Learning Model to Promote Skin Health Equity

Bansri M. Patel,<sup>1</sup> Victoria Humphrey,<sup>1</sup> Alaina J. James,<sup>2</sup>

## The Experience

One in four Americans suffer from dermatologic disease, yet only one in three are seen by a dermatologist.<sup>1</sup> The economic burden of skin disease on quality of life is estimated to amount to \$56.2 billion and is likely magnified for people in underserved communities who face several barriers to accessing dermatologic care.<sup>2,3</sup> People with low income seeking dermatologic care face longer wait times and higher rejection rates than people with private insurance.<sup>4</sup> The geographic maldistribution of dermatologists in majority White, well-resourced areas has further contributed to disparities in access to dermatology providers.<sup>5</sup> Consequently, Hispanic, Black, uninsured people, and people with low income are less likely to utilize outpatient dermatology services compared to their counterparts.<sup>6</sup> Barriers to equitable dermatologic care extend well beyond physical distance. Financial and racial barriers preclude access to novel dermatologic treatments, including biologic therapies for eczema and psoriasis, negatively impacting health outcomes in medically-marginalized communities.<sup>7</sup>

We propose the implementation of dermatology-free clinics as a patient care model to provide free dermatologic care to patients who lack access to specialty care. The Student Dermatology Clinic for the Underserved (SDU) is a student-faculty-run free clinic that operates as a sustainable service-learning model for dermatology residents at the University of Pittsburgh Medical Center (UPMC) and medical students at the University of Pittsburgh School of Medicine (UPSOM). A commitment to increasing sustainable community partnerships in dermatology residency programs across the US can help bridge the gap in access to dermatologic care while strengthening the local healthcare infrastructure. By detailing our experiences at the SDU clinic, we hope to guide other dermatology residency programs interested in integrating a dermatology-free clinic into their residency program curriculum.

The SDU functions as a partnership between the UPMC Department of Dermatology, the UPSOM Dermatology Interest

Group (DIG), and the Squirrel Hill Health Center (SHHC). SHHC is a federally-funded community health center with a focus on delivering healthcare to marginalized people, including immigrants, refugees, people of color, and people who are uninsured. The partnership with primary care providers at the SHHC is essential for coordinated, patient-centered, longitudinal care. Patients are referred to the SDU by primary care physicians at the SHHC. Our dermatology providers discuss patient care and follow-up instructions with SHHC providers to ensure continuity of care. This framework allows for the optimization of the management and treatment of patients with both acute and chronic dermatologic diseases. The partnership between a local community health center like SHHC and an academic institution provides a unique and rewarding learning environment for dermatology trainees, while providing high-quality dermatologic care to underserved patients.

The SDU hosts quarterly clinics with approximately ten patients seen per clinic. The UPMC Department of Dermatology provides all necessary supplies, including but not limited to punch, shave, and excisional biopsy kits, silver nitrate, band-aids, and currettes. All biopsies are read by the University of Pittsburgh Physicians Dermatopathology Unit free of charge. DIG student coordinators oversee medical student volunteer and patient scheduling, while dermatology residents coordinate resident participation. Service-learning was recently added to the aims and objectives of the UPMC dermatology residency curriculum and all residents are required to participate in at least one service-learning activity annually.

The learning environment at the SDU facilitates vertical learning and collaboration at all training levels. Patients are first seen by a team of medical students who present the history and physical exam findings to a dermatology resident. The medical student and resident team then assess the patient together, providing residents the opportunity to teach dermatology to the medical students and hone their clinical reasoning skills. The dermatology attending physician also precepts the medical student and

<sup>1</sup> BS. University of Pittsburgh School of Medicine, Pittsburgh, PA, United States.

<sup>2</sup> MD, Ph.D., FAAD. University of Pittsburgh Medical Center, UPMC, Department of Dermatology, Pittsburgh, PA, United States.

**About the Author:** *Bansri is currently a fourth-year medical student at the University of Pittsburgh School of Medicine, Pittsburgh, PA. Victoria is a 2021 University of Pittsburgh School of Medicine graduate and incoming dermatology resident at Harvard University.*

## Correspondence:

Bansri M Patel. <https://orcid.org/0000-0002-9292-3421>

Address: 3550 Terrace St, Pittsburgh, PA 15213, United States

Email: [bmp55@pitt.edu](mailto:bmp55@pitt.edu)

Editor: Francisco J. Bonilla-Escobar  
Student Editors: Lourdes Adriana Medina-Gaona,  
Diego Carrion Alvarez  
Copyeditor: Nguyen Tran Minh Duc  
Proofreader: Adam Dinoff  
Layout Editor: Francisco J. Bonilla-Escobar

Submission: Jun 22, 2021  
Revisions: Aug 3; Sep 22, 2021  
Responses: Aug 30; Dec 13, 2021  
Acceptance: Dec 13, 2021  
Publication: Jan 24, 2022  
Process: Peer-reviewed

resident team and upholds the role of a “service champion.” As a role model for trainees, the dermatology attending physician exemplifies the importance of community service and ensures that the evolving needs of the underserved population are met.

In this model, patients who may not otherwise have access to a dermatologist are able to receive individualized treatment plans and patient education for a broad array of dermatologic diagnoses. We have treated approximately 320 patients over eight years with diagnoses including psoriasis, verrucous carcinoma, lupus, vitiligo, hidradenitis suppurativa, eczema, keratoacanthoma, lichen planus, and sexually transmitted infections. By leveraging institutional resources and collaborating with local pharmacies, patients benefit from access to low-cost prescription drugs. In our diverse patient population with various primary languages, language barriers are overcome through the use of video and telephonic translation services. During the COVID-19 patient care restrictions, the providers at SHHC have discussed and coordinated patient care with the dermatology service team using teledermatology.

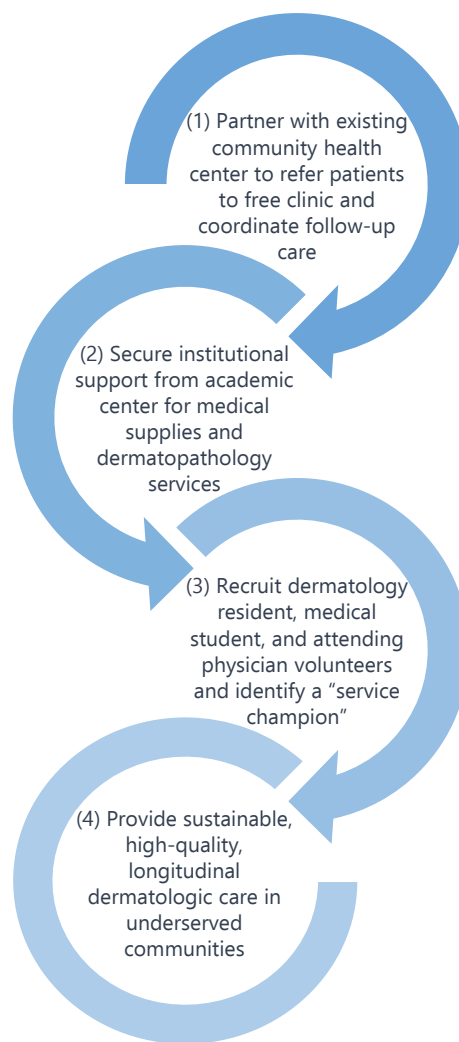
Dermatology relies heavily on visual diagnosis and is a procedural specialty that requires the expertise of personnel that have been trained in dermatology. The SDU promotes bi-directional provider education between SHHC primary care providers and dermatology trainees, resulting in increased patient support. A similar initiative of training community health workers and mid-level providers to provide free skin screenings has been shown to be successful in alleviating the burden of skin disease in a rural Kenyan community.<sup>8</sup>

To evaluate our service-learning model, we distributed a ten-question survey consisting of one multiple-choice, one open-ended, three Likert scale, and five yes/no-questions to dermatology residents who voluntarily participated in the SDU. Nine out of 18 residents completed the survey. Eighty-eight percent (n=8) of the respondents reported that their involvement with the SDU increased their awareness of health disparities and social factors impacting dermatologic care and their participation encouraged them to be more involved in community service throughout their careers.

These findings are well supported in the literature, as dermatology residency programs that integrate service for the underserved into their program goals are three times more successful in graduating residents who practice in underserved

communities.<sup>9</sup> Thereby, academic-community partnerships are efficacious in fostering interest in working with underserved communities (*Figure 1*). In this service-learning model, we address the unique dermatologic needs of patients in marginalized communities and create a rewarding training environment for medical students and dermatology residents to learn about barriers to equitable care in underserved communities.

**Figure 1.** Sustainable Model of Academic-Community Partnerships Implemented by a Dermatology Residency Training Program to Promote Skin Health Equity.



References

1. American Academy of Dermatology (AAD). Burden of Skin Disease. Available from: <https://www.aad.org/member/clinical-quality/clinical-care/bsd>. Last updated 2016; cited Dec 1, 2021.
2. Bickers DR, Lim HW, Margolis D, Weinstock MA, Goodman C, Faulkner E, et al. The burden of skin diseases: 2004: A joint project of the American

- Academy of Dermatology Association and the Society for Investigative Dermatology. *J Am Acad Dermatol.* 2006; 55(3):490-500.
3. Resneck JS, Isenstein A, Kimball AB. Few Medicaid and uninsured patients are accessing dermatologists. *J Am Acad Dermatol.* 2006;55(6):1084-1088.

4. Resneck J, Jr., Pletcher MJ, Lozano N. Medicare, Medicaid, and access to dermatologists: the effect of patient insurance on appointment access and wait times. *J Am Acad Dermatol.* 2004;50(1):85-92.
5. Vaidya T, Zubritsky L, Alikhan A, Housholder A. Socioeconomic and geographic barriers to dermatology care in urban and rural US populations. *J Am Acad Dermatol.* 2018;78(2):406-408.
6. Tripathi R, Knusel KD, Ezaldein HH, Scott JF, Bordeaux JS. Association of Demographic and Socioeconomic Characteristics With Differences in Use of Outpatient Dermatology Services in the United States. *JAMA Dermatol.* 2018 Nov 1;154(11):1286-1291.
7. Takeshita J, Gelfand JM, Li P, Pinto L, Yu X, Rao P, et al. Psoriasis in the US Medicare Population: Prevalence, Treatment, and Factors Associated with Biologic Use. *J Invest Dermatol.* 2015;135(12):2955-2963.
8. Schmeller W. Community health workers reduce skin diseases in East African children. *Int J Dermatol.* 1998;37(5):370-377.
9. Blanco G, Vasquez R, Nezafati K, Allensworth A, Bernstein IH, Cruz PD. How residency programs can foster practice for the underserved. *J Am Acad Dermatol.* 2012;67(1):158-159.

---

**Acknowledgments**

None.

**Conflict of Interest Statement & Funding**

The Authors have no financial relationships or conflicts of interest to disclose.

The Student Dermatology Clinic for the Underserved (SDU) functions as a partnership between the UPMC Department of Dermatology, the University of Pittsburgh School of Medicine Dermatology Interest Group (DIG), and a federally-funded community health center, the Squirrel Hill Health Center (SHHC).

**Author Contributions**

Conceptualization, Methodology, Project Administration, Resources: BMP, VH, AJJ. Investigation: BMP, VH. Supervision: AJJ. Writing – Original Draft Preparation: BMP. Writing – Review & Editing: BMP, VH, AJJ.

**Cite as**

Patel BM, Humphrey V, James AJ. The Student Dermatology Clinic for the Underserved: A Service-Learning Model to Promote Skin Health Equity. *Int J Med Stud.* 2022 Jan-Mar;10(1):98-100.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://open.library.pitt.edu/)



# ASPIRE - A Journey from Intuition to Innovation

Alhad Mulkalwar.<sup>1</sup>

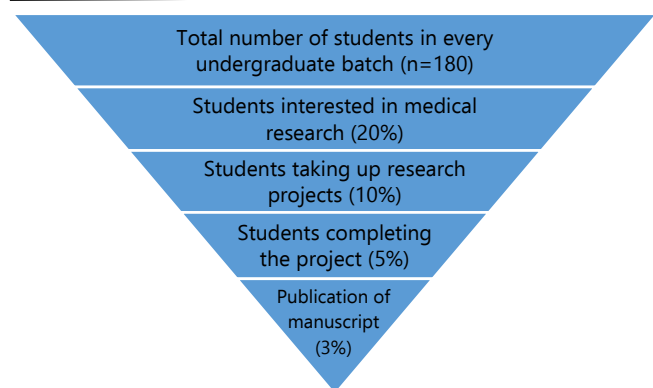
## The Experience

A student's mind is filled with multiple aspirations and fears. For every undergraduate, the path towards their M.B.B.S is an exciting journey of learning and self-discovery. There are many examples of noteworthy contributions by medical students during their studies –the discovery of heparin and the description of the sino-atrial node and pancreatic islets to name a few.<sup>1</sup> Early research exposure also leads to improvement in the productivity of postgraduate research.<sup>2</sup> However, research opportunities for undergraduate students are reported to be unsatisfactory and inadequate and little is known about the challenges students experience when conducting research.<sup>3</sup>

As a medical student passionate for research and having personally realized all that the world of research had to offer, I often wondered why an institute like mine, which produced many quality publications, had so few undergraduate students involved in research. I interacted with my teachers and colleagues to find out the reasons behind this discrepancy. Although many students seemed to be interested in being a part of research activities, few knew how they could start becoming involved. The students who did start a project seldom continued it until the end and very few eventually co-authored the publication (*Figure 1*). This attrition was found to be due to numerous factors including lack of supportive mentorship, conflict with the mainstream course work, or simply loss of interest.

I soon realized that the students needed to have appropriate guidance regarding different aspects of research. At first, I decided to start with something small, on an individual level, to educate my junior colleagues about the different approaches, opportunities and prospects regarding undergraduate medical research. I conducted informal group sessions to share my own research experiences, positive takeaways and the common challenges, pitfalls and dilemmas I faced in the process. Seeing the consistently positive results over three years, I realized the need of a formal institution that could guide the undergraduate students through their research paths. Hence, I decided to establish, in my institute, a department called the Association for Support and Propagation of Innovation, Research and Education (ASPIRE);

**Figure 1.** Results of my survey regarding attitude of medical students towards research depicting high degree of attrition (based on data of undergraduate students of Seth GSMC and KEM Hospital; MBBS batches, 2015-2018).



**Figure 2.** ASPIRE - Association for Support & Propagation of Innovation, Research & Education.



with the intent of supporting and nurturing the curiosity of young medical students (*Figure 2*). This article summarizes my personal experiences as I navigated my way through the tumultuous path to graduation, and more specifically, the lessons from my unique endeavor of ASPIRE.

<sup>1</sup> M.B.B.S (Bachelors Degree in Medical Sciences), Intern, Seth Gordhandas Sunderdas Medical College and King Edward Memorial Hospital, Mumbai, India.

**About the Author:** Dr. Alhad Mulkalwar has completed his graduation and currently working as an Intern (M.B.B.S.) at Seth G.S.M.C. and K.E.M. Hospital, Mumbai, India. He is a recipient of the Indo - Asian Jonas Salk Young Scientist Award in Medical Sciences and the Indo-Pacific Edward Jenner Distinguished Innovative Scholar Award by the International Multidisciplinary Research Foundation in collaboration with United Nations 75<sup>th</sup> Anniversary Dialogue on U.N. Sustainable Development Goals, 2020. He has also received the International Young Researcher Award in Medical Science by the Center for Professional Advancement, West Midlands, United Kingdom.

### Correspondence:

Alhad Mulkalwar. <https://orcid.org/0000-0001-6236-3841>

Address: Acharya Donde Marg, Parel East, Parel, Mumbai, Maharashtra, India.

Email: [alhad.mulkalwar@gmail.com](mailto:alhad.mulkalwar@gmail.com)

Editor: Adam Urback

Student Editors: Muhammad Romail Revisions: Sep 24; Oct 22; Nov 25, 2021; Jan 19, 2022

Manan & Shuo-Yan Gau Responses: Sep 25; Nov 24; Dec 13, 2021; Jan 20, 2022

Proofreader: Ciara Egan Acceptance: Feb 18, 2022

Layout Editor: Francisco J. Bonilla Escobar Publication: Feb 21, 2022

Process: Peer-reviewed

To bridge the existing gaps of research knowledge and opportunities among the undergraduate medical students of the institute, a proposal to establish a student led research council, named ASPIRE, was drafted with the following aims & objectives:

- Collaborate with different departments of the institute to educate students on various aspects of research through seminars and workshops
- Conduct activities and workshops for students to increase the participation of undergraduate students in research projects
- Coordinate with various departments of the college to make ongoing research projects more approachable for the students
- Help students find the right mentor and requisites to work on a novel research idea or innovation
- Guide students working on a research study throughout the process with the help of research experts from our college
- Collaborate with various institutes and trusts of other disciplines to promote research and innovation

The specific mechanisms proposed to achieve the above objectives have been summarized in **Figure 3**. I knew this was not going to be an easy journey. Theoretically, the idea of this new department seemed simple, but altering the status quo at

the institution was sure to invite opposition. In my early days as a student, I was not very good at handling failures and often they had a negative impact on my health; which is why most of my colleagues and close friends warned me against this risk. At times, I was willing to give up on this project before starting due to fear of what may happen and the possibility of failure. However, I realized that not trying was a certain way of failing. I decided it was at least worth a try. Not knowing where to start, I spoke to a few approachable faculty members with whom I had worked with previously. They acknowledged the need for such a platform but were also apprehensive regarding its feasibility and the bureaucratic hurdles that may interfere in its implementation. I met with all the senior professors of the college personally to explain the idea and at the same time incorporate their suggestions to better the model. Although I faced initial resistance, slowly the initiative started garnering support. After almost a year's hard work, I was allowed to present the idea at our Annual General Body Meeting, where the proposal passed with an overwhelming majority. ASPIRE thus became one of India's few student-led Medical Research and Innovation bodies. Today, it is one of the institution's most active organizations, having launched multiple initiatives to improve the awareness about medical research and guiding students along their own research journey.

**Figure 3.** Initiatives Proposed Under ASPIRE to Promote Undergraduate Medical Research.



On a personal level, the gratification for me was not as much for establishing this organization per se, but the ability it gave me to believe in the strength of persistence, patience, and optimism. The journey of this small endeavor was merely one of many enriching experiences I have witnessed throughout studying for my M.B.B.S. I am barely able to remember how shy and introverted I was when I started off my medical school journey. I had spent the better part of my childhood consciously avoiding the tough paths, and thereby avoiding mistakes and failures. It is only now that I realize the importance of risks and failures in personal growth. My advice to all would be to act on their ideas, no matter how uncertain and precarious the journey may seem. Do not let the comfort of inaction rob you of potential greatness. You never know what prospects are in store for you.

These experiences made me realize my love for administration and diplomacy, which eventually led me to quit the field of medicine post-M.B.B.S. to pursue a career in Indian diplomacy. This was not an easy decision. I will admit it is scary starting this new chapter of my life; but I will do it anyway because although I am afraid of failure, I am even more terrified of regret. You do not

need to be fearless, just do not let fear overrun your desire to move past it.

When I envision my career, I choose to focus on the opportunity and not the obligation. I might fail at some point in time, but my undergraduate days taught me to not give up on my goals. So when asked, "Are you really going to change your career despite completing a lengthy and tough degree like M.B.B.S.?" I simply like to reply, "I have finally realized my passion and courage only because of the experiences in my M.B.B.S."

Not having a vision for our lives is the greatest disservice we can do to ourselves. Let every choice and decision of your life be an informed and conscious one. Unfortunate events and setbacks are bound to befall us, and more often than not we will not have a say in these instances. Nevertheless, our success lies in the ability to not give up, and the choice between giving up and going, that is completely in our hands.

It is not easy, but it will definitely be worth it.

## References

1. Brass LF. Is an MD/PhD program right for me? Advice on becoming a physician-scientist. *Mol Biol Cell*. 2018;29(8):881-5.
2. Reinders JJ, Kropmans TJ, Cohen-Schotanus J. Extracurricular research experience of medical students and their scientific output after graduation. *Med Educ*. 2005;39(2):237.
3. Murdoch-Eaton D, Drewery S, Elton S, Emmerson C, Marshall M, Smith JA, Stark P, Whittle S. What do medical students understand by research and research skills? Identifying research opportunities within undergraduate projects. *Med Teach*. 2010;32(3):e152-60.

## Acknowledgments

None.

## Conflict of Interest Statement & Funding

The Authors have no funding, financial relationships or conflicts of interest to disclose.

## Author Contributions

Conceptualization, Writing – Original Draft Preparation, Writing – Review & Editing: AM.

## Cite as

Mulkalwar A. ASPIRE - A Journey from Intuition to Innovation. *Int J Med Stud*. 2022 Jan-Mar;10(1):101-103.

*This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)*

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://open.library.pitt.edu/)

