UC Irvine

Western Journal of Emergency Medicine: Integrating Emergency Care with Population Health

Title

CDEM CORD Special Issue on Education Research and Practice

Permalink

https://escholarship.org/uc/item/36d3r8hk

Journal

Western Journal of Emergency Medicine: Integrating Emergency Care with Population Health, 27(1.1)

ISSN

1936-900X

Authors

Saucedo, Cassandra
Choi, Isabella

Publication Date

2026-01-29

DOI

10.5811/westjem.62234

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at https://creativecommons.org/licenses/by/4.0/

eScholarship.org Powered by the California Digital Library
University of California

Western Journal of Emergency Medicine

VOLUME 27, No 1.1, January 2026

PAGES 1-115



WestJEM

Volume 27, Issue 1.1, January 2026 Open Access at www.westjem.com ISSN 1936-900X

Western Journal of Emergency Medicine:

Integrating Emergency Care with Population Health

Indexed in MEDLINE

COUNCIL OF RESIDENCY DIRECTORS IN EMERGENCY MEDICINE

Special Issue on Educational Research and Practice

CALIFORNIA ACEP

ACOEP The American College of Osteopathic Emergency Physicians

UC Irvine Health

CALAAEM CALIFORNIA CHAPTER DIVISION OF THE AMERICAN ACADEMY OF EMERGENCY MEDICINE

A Peer-Reviewed, International Professional Journal

Find Your Family at ACOEP



In emergency medicine, your team can make all the difference. ACOEP offers that same sense of support and belonging on a professional level. Our community of osteopathic emergency physicians is here to uplift, mentor, and inspire you throughout your career.

Whether you're new to the field or a seasoned professional, ACOEP is more than an association – it's a family. Join us today and experience the power of community!

ACOEP
The American College of Osteopathic Emergency Physicians

PennState Health

Penn State Health Emergency Medicine



About Us: Penn State Health is a multi-hospital health system serving patients and communities across central Pennsylvania. We are the only medical facility in Pennsylvania to be accredited as a Level I pediatric trauma center and Level I adult trauma center. The system includes Penn State Health Milton S. Hershey Medical Center, Penn State Health Children's Hospital and Penn State Cancer Institute based in Hershey, Pa.; Penn State Health Hampden Medical Center in Enola, Pa.; Penn State Health Holy Spirit Medical Center in Camp Hill, Pa.; Penn State Health Lancaster Medical Center in Lancaster, Pa.; Penn State Health St. Joseph Medical Center in Reading, Pa.; Pennsylvania Psychiatric Institute, a specialty provider of inpatient and outpatient behavioral health services, in Harrisburg, Pa.; and 2,450+ physicians and direct care providers at 225 outpatient practices. Additionally, the system jointly operates various healthcare providers, including Penn State Health Rehabilitation Hospital, Hershey Outpatient Surgery Center and Hershey Endoscopy Center.



We foster a collaborative environment rich with diversity, share a passion for patient care, and have a space for those who share our spark of innovative research interests. Our health system is expanding and we have opportunities in both academic hospital as well community hospital settings.

Benefit highlights include:

- Competitive salary with sign-on bonus
- Comprehensive benefits and retirement package
- Relocation assistance & CME allowance
- Attractive neighborhoods in scenic central Pennsylvania



FOR MORE INFORMATION PLEASE CONTACT:

Amber Winters, MBA
Penn State Health Physician Recruiter
awinters@pennstatehealth.psu.edu

Penn State Health is fundamentally committed to the diversity of our faculty and staff. We believe diversity is unapologetically expressing itself through every person's perspectives and lived experiences. We are an equal opportunity and affirmative action employer. All qualified applicants will receive consideration for employment without regard to age, color, disability, gender identity or expression, marital status, national or ethnic origin, political affiliation, race, religion, sex (including pregnancy), sexual orientation, veteran status, and family medical or genetic information.




JOIN US AT
ACADEMIC ASSEMBLY 2026
register now
Orlando, FL | March 26 - 29 | Pre-Day: March 25





SAEM26

ATLANTA MARRIOTT MARQUIS · ATLANTA, GA
MAY 18-21, 2026

Society For Academic Emergency Medicine
1111 East Touhy Avenue, Suite 540 | Des Plaines, IL 60018
SAEM.org | Ph: 847-257-7236 | exhibitors@saem.org



CORD EM Survival Packs

- Mass Casualty Incident
- Sudden Resident Death
- Matched Resident – Failure to Start

Built for real-world challenges, CORD Survival Packs equip program leadership with actionable strategies to prepare for, manage, and recover from a wide range of scenarios.

www.cordem.org

SAVE THE DATE

SAEM26

ATLANTA, GA • MAY 18-21, 2026

SAEM26 CDEM ACADEMY MEETING

Clerkship Directors in Emergency Medicine

Clerkship Directors in Emergency Medicine (CDEM) Meeting

Atlanta Marriott Marquis | Tuesday, May 19, 2026 | 3:00 PM - 4:50 PM

www.saem.org/cdem

ADDITIONAL RESOURCES OFFERED BY SAEM/CDEM

- **SAEMTests**
- **CDEM Curriculum**



Journal of Education & Teaching in Emergency Medicine

A publication of CORD

Education

We believe that all learners should benefit from active learning.
We are an online, open access, peer-reviewed journal-repository for EM educators in all major topic areas.

Scholarship

We believe educators should advance through the scholarship of their educational work. JETem gives you the opportunity to publish & distribute your outstanding, scholarly academic work.

Submit your content or contact us to become a reviewer!



www.jetem.org



published by
eScholarship University of California

Western Journal of *Emergency Medicine*:
CDEM/CORD 2026 Special Education Issue

A Note from the Editors:

We are excited to publish the 11th issue of the Western Journal of Emergency Medicine (WestJEM) Special Issue in Educational Research & Practice (Special Issue). Over a decade ago a unique relationship was formed between WestJEM, the Council of Residency Director for Emergency Medicine and the Clerkship Directors of Emergency Medicine to develop a publication that disseminates educational scholarship which impacts our communities while promoting the growth, as authors, of our junior faculty. The structure of the Special Issue provides a diversity of submission categories such as original research, educational advances, best practices, reviews and scholarly perspectives. This selection provides an opportunity for all scholars and scholarly approaches to have a voice. A successful Special Issue requires the courage of the authors to submit their work for peer review. In turn, we do our best to provide detailed feedback regardless of the final decision. Publication of the issue requires the commitment and hard work of the publication staff, leadership of the organizations, editors, and peer reviewers. We want to thank them all for their efforts and professionalism. The topics of this year's education issue reflect many of the current issues in medical education today. We have begun receiving and reviewing submissions for next year's Special Issue. The editorial staff review every submission on a rolling basis. Once accepted, the articles are available on PubMed in an expedited process. There are also no processing fees when accepted to the Special Issue. This is a great opportunity to submit your educational scholarship, thereby enhancing your professional development while disseminating your work to others. We are delighted that this initiative has flourished and look forward to seeing your work on display in this, our 11th issue.

Jeffrey Love, MD
Georgetown University School of Medicine
Co-Editor of Annual Special Issue on Education Research and Practice

Douglas Ander, MD
Emory University
Co-Editor of Annual Special Issue on Education Research and Practice

The *Western Journal of Emergency Medicine: Integrating Emergency Care with Population Health* would like to thank The Clerkship Directors in Emergency Medicine (CDEM) and the Council of Residency Directors in Emergency Medicine (CORD) for helping to make this collaborative special issue possible.

Western Journal of *Emergency Medicine*:

Integrating Emergency Care with Population Health

Indexed in **MEDLINE, PubMed, and Clarivate Web of Science, Science Citation Index Expanded**

JOURNAL FOCUS

Emergency medicine is a specialty which closely reflects societal challenges and consequences of public policy decisions. The emergency department specifically deals with social injustice, health and economic disparities, violence, substance abuse, and disaster preparedness and response. This journal focuses on how emergency care affects the health of the community and population, and conversely, how these societal challenges affect the composition of the patient population who seek care in the emergency department. The development of better systems to provide emergency care, including technology solutions, is critical to enhancing population health.

Table of Contents

Best Practices

1 **Resident-as-Teacher Curriculum: An Evidence-based Guide to Best Practices from the Council of Residency Directors in Emergency Medicine**
J Jordan, M Gottlieb, M Estes, ME Parsons, K Goldflam, A Grock, BJ Long, S Natesan

Original Research

10 **A Qualitative Study of Senior Residents' Strategies to Prepare for Unsupervised Practice**
M Griffith, A Garrett, BK Watsjold, J Jauregui, M Davis, JS Ilgen

19 **Characteristics and Educational Support Resources Available to Emergency Medicine Core Faculty: A National Survey**
J Jordan, LR Hopson, F Gallahue, JA Cranford, JC Burkhardt, KE Kocher, DL Robinett, M Weizberg, T Murano

27 **Substantial Variation Exists in Clinical Exposure to Chief Complaints Among Residents Within an Emergency Medicine Training Program**
CM. Jewell, AT Hummel, DJ Hekman, BH Schnapp

33 **Harder, Better, Faster, Stronger? Residents Seeing More Patients Per Hour See Lower Complexity**
CM Jewell, G (Anthony) Bai, DJ Hekman, AM Nicholson, MR Lasarev, R Alexandridis, BH Schnapp

40 **The Effect of Hospital Boarding on Emergency Medicine Residency Productivity**
P Moffett, A Best, N Lewis, S Miller, G Hickam, H Kissel-Smith, L Barrera, S Huang, J Moll

49 **Leadership Perceptions, Educational Struggles and Barriers, and Effective Modalities for Teaching Vertigo and the HINTS Exam: A National Survey of Emergency Medicine Residency Program Directors**
M McLean, J Stowens, R Barnicle, N Mafi, K Shah

57 **Push and Pull: What Factors Attracted Applicants to Emergency Medicine and What Factors Pushed Them Away Following the 2023 Match**
M Kiemeney, J Morris, L Lamparter, M Weizberg, A Little, B Milman

67 **Emergency Medicine Residency Website Wellness Pages: A Content Analysis**
A Sappington, B Milman

74 **Inequities in the National Clinical Assessment Tool for Medical Students in the Emergency Department**
BZ Amin, CJ Dine, ER Tabakin, M Trotter, JK Heath

Policies for peer review, author instructions, conflicts of interest and human and animal subjects protections can be found online at www.westjem.com.

Western Journal **of** *Emergency Medicine*:
Integrating Emergency Care with Population Health
Indexed in **MEDLINE, PubMed, and Clarivate Web of Science, Science Citation Index Expanded**

Table of Contents *continued*

Brief Research Reports

84 **Program Director Perspectives on the Impact of the Proposed 48-Month Emergency Medicine Residency Requirement: A National Survey**
R Austin, C Patel, K Delfino, S Kim

90 **Virtual Interviews Correlate with Home and In-State Match Rates at One Emergency Medicine Program**
C Motzkus, C Frey, A Humbert

Edcuational Advances

95 **Development of a Reliable, Valid Procedural Checklist for Assessment of Emergency Medicine Resident Performance of Emergency Cricothyrotomy**
DE Loke, AM Rogers, ML McCarthy, MK Leibowitz, ET Stulpin, DH Salzman

Brief Educational Advances

101 **A Taste of Our Own Medicine: Fostering Empathy in Medical Learners Through Patient Simulation**
RP Peña, W Weber

105 **Effectiveness of a Collaborative, Virtual Outreach Curriculum for 4th-Year EM-bound Students at a Medical School Affiliated with a Historically Black College and University**
C Brown, R Carter, N Hartman, A Hammond, E MacNeill, L Holden, A Pierce, L Campbell, M Norman

Editorial

111 **A 30-year History of the Emergency Medicine Standardized Letter of Evaluation**
JS Hegarty, CB Hegarty, JN Love, A Pelletier-Bui, S Bord, MC Bond, SM Keim, K Hamilton, EF Shappell

Policies for peer review, author instructions, conflicts of interest and human and animal subjects protections can be found online at www.westjem.com.

2025 Gold Standard Reviewers

The *West*JEM Special Issue in Educational Research & Practice couldn't exist without our many reviewers. To all, we wish to express our sincerest appreciation for their contributions to this year's success. Each year a number of reviewers stand out for their (1) detailed reviews, (2) grasp of the tenets of education scholarship and (3) efforts to provide feedback that mentors authors on how to improve. This year's "Gold Standard" includes:

- Max Berger (UCLA Medical Center)
- April Choi (Rutgers New Jersey Medical School)
- Anna Darby, Jeff Riddell (Keck School of Medicine-USC)*
- Zoe Fisher, Jenna Paul Schultz, Linda Regan (Johns Hopkins)*
- Max Griffith (University of Washington)
- Kirlos Haroun, Katie Lorenz, Kathryn Ritter, Linda Regan (Johns Hopkins)*
- Arman Hussain, Claudia Ranniger (George Washington University)*
- Carlos Jaquez, Daniela Ortiz (Baylor College of Medicine)*
- Corlin Jewell (University of Wisconsin)
- Chelsea Johnson, Anne Messman (Wayne State University)*
- Justine McGiboney (University of Alabama-Birmingham)
- Vivek Medepalli, Avirale Sharma, Larissa Valez (UT Southwestern)*
- Joe-Ann Moser (University of Wisconsin)
- Collyn Murray (University of North Carolina)
- Elspeth Pearce (University of Kansas Medical Center)
- Jessica Pellitier (University of Missouri)
- Monica Shah, Patrick Felton, Bryanne McDonald, Lucienne Lutfy-Clayton (University of Massachusetts)*
- Emily Straley, Vicki Zhou, Richard Bounds (University of Vermont)*
- NeelouTabatabai, Samual O Clarke (UC Davis)*
- Thadeus Schmitt (Medical College of Wisconsin)
- Juhi Varshney, Michael Zdradzinski (Emory University)*
- Kalen Wright, Eric Shappell (Harvard-Massachusetts General Hospital)*
- Chris Yang, Tim Koboldt, Chelsea Broomhead, Margaret Goodrich (Missouri Health)*
- Ivan Zvonar, Jon Ilgen (University of Washington)*
- Ivan Zvonar (University of Washington)

*Mentored Peer Reviews from Emergency Medicine Education Fellowship Programs

CDEM/CORD Guest Consulting Editors

We would also like to recognize our guest consulting editors who assisted with pre-screening submissions during our initial peer-review stages.
Thank you for all of your efforts and contributions.

CDEM

- Christine Stehman
- Eric Shappell
- Sharon Bord
- Andrew Golden

CORD

- Jenna Fredette
- Danielle Hart
- William Soares III
- Jamie Jordan
- Anne Messman
- Logan Weygandt

Consulting Statistician/ Psychometrician

- David Way

Clerkship Directors in Emergency Medicine

COUNCIL OF RESIDENCY DIRECTORS IN EMERGENCY MEDICINE

Western Journal of *Emergency Medicine*:

Integrating Emergency Care with Population Health

Indexed in **MEDLINE, PubMed, and Clarivate Web of Science, Science Citation Index Expanded**

Jeffrey N. Love, MD, Guest Editor
Georgetown School of Medicine- Washington, District of Columbia

Danielle Hart, MD, MACM, Associate Guest Editor
Hennepin Healthcare-Minneapolis, Minnesota

Benjamin Schnapp, MD, MEd, Associate Guest Editor
University of Wisconsin-Madison, Wisconsin

Wendy Macias-Konstantopoulos, MD, MPH, Associate Editor
Massachusetts General Hospital- Boston, Massachusetts

Danya Khoujah, MBBS, Associate Editor
University of Maryland School of Medicine- Baltimore, Maryland

Patrick Joseph Maher, MD, MS, Associate Editor
Ichan School of Medicine at Mount Sinai- New York, New York

Yanina Purim-Shem-Tov, MD, MS, Associate Editor
Rush University Medical Center-Chicago, Illinois

Gayle Galletta, MD, Associate Editor
University of Massachusetts Medical School-Worcester, Massachusetts

Dan Mayer, MD, Associate Editor
Retired from Albany Medical College- Niskayuna, New York

Julianna Jung, MD, Associate Guest Editor
Johns Hopkins Hospital, Baltimore, Maryland

Douglas Franzen, MD, Associate Guest Editor
Harborview Medical Center, Seattle, Washington

Gentry Wilkerson, MD, Associate Editor
University of Maryland

Michael Gottlieb, MD, Associate Editor
Rush Medical Center-Chicago, Illinois

Sara Krzyzaniak, MD Associate Guest Editor
Stanford Universtiy-Palo Alto, California

Susan R. Wilcox, MD, Associate Editor
Massachusetts General Hospital- Boston, Massachusetts

Donna Mendez, MD, EdD, Associate Editor
University of Texas-Houston/McGovern Medical School- Houston, Texas

Taku Taira, MD, EDD, Associate Guest Editor
LAC + USC Medical Center-Los Angeles, California

Douglas S. Ander, MD, Guest Editor
Emory University School of Medicine-Atlanta, Georgia

Edward Ullman, MD, Associate Guest Editor
Harvard University-Cambridge, Massachusetts

Abra Fant MD, MS, Associate Guest Editor
Northwestern Medicine-Chicago, Illinois

Kendra Parekh, MD, MS, Associate Guest Editor
Vanderbilt University-Nashville, Tennessee

Matthew Tews, DO, MS, Associate Guest Editor
Indiana University School of Medicine, Augusta, Georgia

Rick A. McPheeters, DO, Associate Editor
Kern Medical- Bakersfield, California

Niels K. Rathlev MD, MS, Associate Editor
Tufts University School of Medicine-Boston, Massachusetts

Shahram Lotfipour, MD, MPH, Managing Associate Editor
University of California, Irvine School of Medicine- Irvine, California

Mark I. Langdorf, MD, MHPE, Editor-in-Chief
University of California, Irvine School of Medicine- Irvine, California

Section Editors

Behavioral Emergencies
Bradford Brobin, MD, MBA
Chicago Medical School

Marc L. Martel, MD
Hennepin County Medical Center

Ryan Ley, MD
Hennepin County Medical Center

Cardiac Care
Sam S. Torbati, MD
Cedars-Sinai Medical Center

Rohit Menon, MD
University of Maryland

Elif Yucebay, MD
Rush University Medical Center

Mary McLean, MD
AdventHealth

Climate Change
Gary Gaddis, MBBS
University of Maryland

Clinical Practice
Casey Clements, MD, PhD
Mayo Clinic

Murat Cetin, MD
Behçet Uz Child Disease and Pediatric Surgery Training and Research Hospital

Patrick Meloy, MD
Emory University

Carmine Nasta, MD
Università degli Studi della Campania "Luigi Vanvitelli"

David Thompson, MD
University of California, San Francisco

Tom Benzoni, DO
Des Moines University of Medicine and Health Sciences

Critical Care
Christopher "Kit" Tainter, MD
University of California, San Diego

Joseph Shiber, MD
University of Florida-College of Medicine

David Page, MD
University of Alabama

Quincy Tran, MD, PhD
University of Maryland

Antonio Esquinas, MD, PhD, FCCP, FNIV
Hospital Morales Meseguer

Dell Simmons, MD
Geisinger Health

Disaster Medicine
Andrew Milsten, MD, MS
UMass Chan Medical Center

John Broach, MD, MPH, MBA, FACEP
University of Massachusetts Medical School
UMass Memorial Medical Center

Christopher Kang, MD
Madigan Army Medical Center

Scott Goldstein, MD
Temple Health

Education
Danya Khoujah, MBBS
University of Maryland School of Medicine

Jeffrey Druck, MD
University of Colorado

Asit Misra, MD
University of Miami

Cameron Hanson, MD
The University of Kansas Medical Center

ED Administration, Quality, Safety
Gary Johnson, MD
Upstate Medical University

Brian J. Yun, MD, MBA, MPH
Harvard Medical School

Laura Walker, MD
Mayo Clinic

León D. Sánchez, MD, MPH
Beth Israel Deaconess Medical Center

Robert Derlet, MD
Founding Editor, California Journal of Emergency Medicine
University of California, Davis

Tehreem Rehman, MD, MPH, MBA
Beth Israel Deaconess Medical Center

Anthony Rosania, MD, MHA, MSHI
Rutgers University

Neil Dasgupta, MD, FACEP, FAAEM
Nassau University Medical Center

Emergency Medical Services
Daniel Joseph, MD
Yale University

Joshua B. Gaither, MD
University of Arizona, Tuscon

Julian Mapp
University of Texas, San Antonio

Shira A. Schlesinger, MD, MPH
Harbor-UCLA Medical Center

Tiffany Abramson, MD
University of Southern California

Jason Pickett, MD
University of Utah Health

Geriatrics
Stephen Meldon, MD
Cleveland Clinic

Luna Ragsdale, MD, MPH
Duke University

Health Equity
Cortlyn W. Brown, MD
Carolinas Medical Center

Faith Quenzer
Temecula Valley Hospital
San Ysidro Health Center

Victor Cisneros, MD MPH
Eisenhower Health

Sara Heinert, PhD, MPH
Rutgers University

Naomi George, MD MPH
University of Mexico

Sarah Aly, DO
Yale School of Medicine

Lauren Walter, MD
University of Alabama

Infectious Disease
Elissa Schechter-Perkins, MD, MPH
Boston University School of Medicine

Ioannis Koutroulis, MD, MBA, PhD
George Washington University School of Medicine and Health Sciences

Stephen Liang, MD, MPHS
Washington University School of Medicine

Injury Prevention
Mark Faul, PhD, MA
Centers for Disease Control and Prevention

Wirachin Hoonpongsimanont, MD, MSBATS
Eisenhower Medical Center

International Medicine
Heather A.. Brown, MD, MPH
Prisma Health Richland

Taylor Burkholder, MD, MPH
Keck School of Medicine of USC

Christopher Greene, MD, MPH
University of Alabama

Chris Mills, MD, MPH
Santa Clara Valley Medical Center

Shada Rouhani, MD
Brigham and Women's Hospital

Legal Medicine
Melanie S. Heniff, MD, JD
Indiana University School of Medicine

Statistics and Methodology
Shu B. Chan MD, MS
Resurrection Medical Center

Soheil Saadat, MD, MPH, PhD
University of California, Irvine

James A. Meltzer, MD, MS
Albert Einstein College of Medicine

Monica Gaddis, PhD
University of Missouri, Kansas City School of Medicine

Emad Awad, PhD
University of Utah Health

Musculoskeletal
Juan F. Acosta DO, MS
Pacific Northwest University

Neurosciences
Rick Lucarelli, MD
Medical City Dallas Hospital

William D. Whetstone, MD
University of California, San Francisco

Antonio Siniscalchi, MD
Annunziata Hospital, Cosenza, Italy

Pediatric Emergency Medicine
Muhammad Waseem, MD
Lincoln Medical & Mental Health Center

Cristina M. Zeretzke-Bien, MD
University of Florida

Jabeen Fayyaz, MD
The Hospital for Sick Children

Official Journal of the California Chapter of the American College of Emergency Physicians, the American College of Osteopathic Emergency Physicians, the California Chapter of the American Academy of Emergency Medicine, and Official International Journal of the World Academic Council of Emergency Medicine (WACEM)

Available in MEDLINE, PubMed, PubMed Central, CINAHL, SCOPUS, Google Scholar, eScholarship, Melvyl, DOAJ, EBSCO, EMBASE, Medscape, HINARI, and MDLinx Emergency Med. Members of OASPA.
Editorial and Publishing Office: *West*JEM/Depatment of Emergency Medicine, UC Irvine Health, 3800 W Chapman Ave Ste 3200, Orange, CA 92868, USA. Office: 1-714-456-6389; Email: Editor@westjem.org.

Western Journal of *Emergency Medicine*:

Integrating Emergency Care with Population Health

Indexed in **MEDLINE, PubMed, and Clarivate Web of Science, Science Citation Index Expanded**

This open access publication would not be possible without the generous and continual financial support of our society sponsors, department and chapter subscribers.

Professional Society Sponsors

American College of Osteopathic Emergency Physicians

California ACEP

California Chapter Division of American Academy of Emergency Medicine

Academic Department of Emergency Medicine Subscriber

Alameda Health System-Highland Hospital
Oakland, CA

Ascension Resurrection
Chicago, IL

Arnot Ogden Medical Center
Elmira, NY

Atrium Health Wake Forest Baptist
Winston-Salem, NC

Baylor College of Medicine
Houston, TX

Baystate Medical Center
Springfield, MA

Beth Israel Deaconess Medical Center
Boston, MA

Brigham and Women's Hospital
Boston, MA

Brown University-Rhode Island Hospital
Providence, RI

Carolinas Medical Center
Charlotte, NC

Cedars-Sinai Medical Center
Los Angeles, CA

Cleveland Clinic
Cleveland, OH

Desert Regional Medical Center
Palm Springs, CA

Eisenhower Health
Rancho Mirage, CA

Emory University
Atlanta, GA

Franciscan Health
Carmel, IN

Geisinger Medical Center
Danville, PA

Healthpartners Institute/ Regions Hospital
Minneapolis, MN

Hennepin Healthcare
Minneapolis, MN

Henry Ford Hospital
Detroit, MI

Henry Ford Wyandotte Hospital
Wyandotte, MI

Howard County Department of Fire and Rescue
Marriotsville, MD

Icahn School of Medicine at Mt Sinai
New York, NY

Indiana University School of Medicine
Indianapolis, IN

INTEGRIS Health
Oklahoma City, OK

Kaweah Delta Health Care District
Visalia, CA

Kent Hospital
Warwick, RI

Kern Medical
Bakersfield, CA

Loma Linda University Medical Center
Loma Linda, CA

Louisiana State University Shreveport
Shereveport, LA

Massachusetts General Hospital/ Brigham and
Women's Hospital/ Harvard Medical
Boston, MA

Mayo Clinic in Florida
Jacksonville, FL

Mayo Clinic College of Medicine in Rochester
Rochester, MN

Mayo Clinic in Arizona
Phoeniz, AZ

Medical College of Wisconsin Affiliated Hospital
Milwaukee, WI

Mount Sinai Medical Center Miami Beach
Miami Beach, FL

Mount Sinai Morningside
New York, NY

New York University Langone Health
New York, NY

North Shore University Hospital
Manhasset, NY

NYC Health and Hospitals/ Jacobi
New York, NY

Ochsner Medical Center
New Orleans, LA

Ohio State University Wexner Medical Center
Columbus, OH

Oregon Health and Science University
Portland, OR

Penn State Milton S. Hershey Medical Center
Hershey, PA

Poliklinika Drinkovic
Zagreb, Croatia

Prisma Health/ University of South Carolina SOM Greenville
Greenville, SC

Rush University Medical Center
Chicago, IL

Rutgers Robert Wood Johnson Medical School
New Brunswick, NJ

St. Luke's University Health Network
Bethlehem, PA

Southern Illinois University School of Medicine
Springfield, IL

Stony Brook University Hospital
Stony Brook, NY

SUNY Upstate Medical University
Syracuse, NY

Temple University
Philadelphia, PA

Texas Tech University Health Sciences Center
El Paso, TX

State Chapter Subscriber

Arizona Chapter Division of the American Academy of Emergency Medicine

California Chapter Division of the American Academy of Emergency Medicine

Florida Chapter Division of the American Academy of Emergency Medicine

Great Lakes Chapter Division of the American Academy of Emergency Medicine

Tennessee Chapter Division of the American Academy of Emergency Medicine

Uniformed Services Chapter Division of the American Academy of Emergency Medicine

Virginia Chapter Division of the American Academy of Emergency Medicine

International Society Partners

Emergency Medicine Association of Turkey

Lebanese Academy of Emergency Medicine

Mediterranean Academy of Emergency Medicine

Norwegian Society for Emergency Medicine

Sociedad Argentina de Emergencias

Sociedad Chileno Medicina Urgencia

Thai Association for Emergency Medicine

To become a *West*JEM departmental sponsor, waive article processing fee, receive print and copies for all faculty and electronic for faculty/residents, and free CME and faculty/fellow position advertisement space, please go to http://westjem.com/subscribe or contact:

Stephanie Burmeister
*West*JEM Staff Liaison
Phone: 1-800-884-2236
Email: sales@westjem.org

Western Journal of *Emergency Medicine*:

Integrating Emergency Care with Population Health

Indexed in **MEDLINE, PubMed, and Clarivate Web of Science, Science Citation Index Expanded**

This open access publication would not be possible without the generous and continual financial support of our society sponsors, department and chapter subscribers.

Professional Society Sponsors

American College of Osteopathic Emergency Physicians

California ACEP

California Chapter Division of American Academy of Emergency Medicine

Academic Department of Emergency Medicine Subscriber

The University of Texas Medical Branch
Galveston, TX

UT Health Houston McGovern Medical School
Houston, TX

Touro University College of Osteopathic Medicin
Vallejo, CA

Trinity Health Muskegon Hospital
Muskegon, MI
UMass Memorial Health
Worcester, MA

University at Buffalo Program
Buffalo, NY

University of Alabama, Birmingham
Birmingham, AL

University of Arizona College of Medicine-Tucson
Little Rock, AR

University of Arkansas for Medical Sciences
Galveston, TX

University of California, Davis Medical Center
Sacramento, CA

University of California San Francisco General Hospital
San Francisco, CA

University of California San Fracnsico Fresno
Fresno, CA

University of Chicago
Chicago, IL

University of Cincinnati Medical Center/ College of Medicine
Cincinnati, OH

University of Colorado Denver
Denver, CO

University of Florida, Jacksonville
Jacksonville, FL

University of Illinois at Chicago
Chicago, IL

University of Iowa Hospitals and Clinics
Iowa City, IA

University of Kansas Health System
Kansas City, IA

University of Louisville
Louisville, KY

University of Maryland School of Medicine
Baltimore, MD

University of Miami Jackson Health System
Miami, FL

University of Michigan
Ann Arbor, MI

University of North Dakota School of Medicine and Health Sciences
Grand Forks, ND

University of Southern Alabama
Mobile, AL

University of Southern California
Los Angeles, CA
University of Vermont Medical Cneter
Burlington, VA

University of Virginia Health
Charlottesville, VA

University of Washington - Harborview Medical Center
Seattle, WA

University of Wisconsin Hospitals and Clinics
Madison, WI

UT Southwestern Medical Center
Dallas, TX

Franciscan Health Olympia Fields
Phoenix, AZ

WellSpan York Hospital
York, PA

West Virginia University
Morgantown, WV

Wright State University Boonshoft School of Medicine
Fairborn, OH

Yale School of Medicine
New Haven, CT

State Chapter Subscriber

Arizona Chapter Division of the American Academy of Emergency Medicine

California Chapter Division of the American Academy of Emergency Medicine

Florida Chapter Division of the American Academy of Emergency Medicine

Great Lakes Chapter Division of the American Academy of Emergency Medicine

Tennessee Chapter Division of the American Academy of Emergency Medicine

Uniformed Services Chapter Division of the American Academy of Emergency Medicine

Virginia Chapter Division of the American Academy of Emergency Medicine

International Society Partners

Emergency Medicine Association of Turkey

Lebanese Academy of Emergency Medicine

Mediterranean Academy of Emergency Medicine

Norwegian Society for Emergency Medicine

Sociedad Argentina de Emergencias

Sociedad Chileno Medicina Urgencia

Thai Association for Emergency Medicine

To become a *West*JEM departmental sponsor, waive article processing fee, receive print and copies for all faculty and electronic for faculty/residents, and free CME and faculty/fellow position advertisement space, please go to http://westjem.com/subscribe or contact:

Stephanie Burmeister
*West*JEM Staff Liaison
Phone: 1-800-884-2236
Email: sales@westjem.org

Resident-as-Teacher Curriculum: An Evidence-based Guide to Best Practices from the Council of Residency Directors in Emergency Medicine

Jaime Jordan, MD, MAEd[*†]
Michael Gottlieb, MD[‡]
Molly Estes, MD[§]
Melissa E. Parsons, MD[‖]
Katja Goldflam, MD[#]
Andrew Grock, MD[*]
Brit J. Long, MD[¶]
Sree Natesan, MD[**]

[*]David Geffen School of Medicine at University of California Los Angeles, Department of Emergency Medicine, Los Angeles, California
[†]Oregon Health & Science University, Department of Emergency Medicine, Portland, Oregon
[‡]Rush University Medical Center, Department of Emergency Medicine, Chicago, Illinois
[§]Northwestern University, Department of Emergency Medicine, Chicago, Illinois
[‖]University of Florida College of Medicine, Department of Emergency Medicine, Jacksonville, Florida
[#]Yale School of Medicine, Department of Emergency Medicine, New Haven, Connecticut
[¶]Brooke Army Medical Center, Department of Emergency Medicine, San Antonio, Texas
[**]Duke University, Division of Emergency Medicine, Durham, North Carolina

Section Editor: Kendra Parekh, MD, MHPE
Submission history: Submitted December 14, 2024; Revision received May 17, 2025; Accepted May 17, 2025
Electronically published September 24, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.41493

Improving resident teaching skills is an expectation of training. Despite the recognized importance of resident-as-teacher (RaT) curricula, variability indicates the need for evidence-based guidelines to inform best practices. This paper outlines expert guidelines for the development, implementation, and evaluation of RaT curricula from the members of the Council of Residency Directors in Emergency Medicine Best Practices Subcommittee, based on a critical review of the literature. It is important to perform a needs assessment prior to creating and implementing a RaT curriculum. The RaT curricula should include instruction on adult learning theory, feedback, and classroom and bedside teaching techniques. Outcomes of RaT curricula should be assessed using multiple sources including direct observation and incorporate both knowledge and skill retention, as well as acquisition. [West J Emerg Med. 2025;26(5)1135–1143.]

BACKGROUND

Training future physicians to be teachers is an important curricular component of residency programs and supported by the Accreditation Council for Graduate Medical Education (ACGME), which states that residents are expected to participate in the education of patients, families, students, residents, and other health professionals and should be encouraged to teach using a scholarly approach.[1] Resident-as-teacher (RaT) curricula hold the potential to provide numerous benefits to residents, medical students, and patients by enhancing teaching skills that allow for transfer of knowledge.[2-17] Benefits of RaT programs across medical specialties include improved teaching skills, self-reflection, self-efficacy in teaching, and improved educational outcomes for both residents and their learners, as well as better outcomes for patient care.[2-17]

Despite recommendations to provide this training in residency and a substantial body of literature on the topic, there is no standard approach to RaT curricula.[1] This deficit can lead to variability in education skill development for resident trainees. It also leaves education leaders uncertain about how to best provide this important training in their programs. While a few prior reviews have sought to address this topic, they include only a small number of papers, are narrow in scope (focusing on the benefits and effectiveness of RaT curricula rather than how to best deliver this type of

instruction), and may be outdated and not reflect the current literature available.[6,9,13,17] Therefore, a critical need exists to develop best practices and evidence-based guidelines to optimize RaT curricular content, implementation, and evaluation in graduate medical education training programs.

Based on the best available evidence through a critical review of the literature, we offer expert guidelines on RaT curricular content, implementation, and evaluation from members of the Council of Residency Directors in Emergency Medicine (CORD) Best Practices Subcommittee. This paper provides readers with recommendations on the content, educational strategies, curricular implementation, and program evaluation for RaT curricula.

Population Health Research Capsule

What do we already know about this issue?
Resident-as-teacher (RaT) curricula are an important part of residency training and have many potential benefits.

What was the research question?
What are best practices for RaT curricular content, implementation, and evaluation in graduate medical education training programs?

What was the major finding of the study?
This paper offers expert recommendations for best practices on RaT curricular content, implementation, and evaluation.

How does this improve population health?
Improving teaching skills ultimately leads to better education outcomes for residents and better care of their patients.

CRITICAL APPRAISAL

This is the 11th paper in a series of evidence-based best practice reviews from the CORD Best Practices Subcommittee.[18-27] The author group consists of expert emergency medicine (EM) educators and education researchers with experience in residency program education and leadership. We conducted a literature search in conjunction with a medical librarian using MEDLINE with a combination of Medical Subject Heading terms and keywords focused on RaT curricula searching for papers published from inception to December 31, 2023 (Supplemental Appendix 1). We also reviewed the bibliographies of all included papers. Two authors (JJ and SN) independently screened and included papers that addressed RaT curricula development, implementation and evaluation. We excluded papers that were not related to RaT curricula development, implementation, or evaluation. We also excluded papers that were not in English, were abstracts only, or did not have full text available. Papers were included based on agreement of the two screeners. The two screeners resolved discrepancies through in-depth discussion and negotiated consensus.

The search yielded 1,486 papers, of which 89 were deemed to be directly relevant to this review (Supplemental Appendix 2). The author group derived their best practice recommendations based on the literature review and discussion among the expert author group. The level and grade of evidence were provided for each best practice statement implementing the Oxford Center for Evidence-Based Medicine criteria (Tables 1 and 2).[28] When supporting data were not available, recommendations were made based upon the authors' combined experience and consensus opinion. Prior to submission, the manuscript was reviewed by the CORD Best Practices Subcommittee and posted to the CORD website for two weeks for peer review by the entire CORD medical education community. Upon completion of the review period, there was general agreement, and no substantial changes to the guideline were recommended.

Table 1. Oxford Centre for Evidence-Based Medicine levels of evidence.[28]

Level of Evidence	Definition
1a	Systematic review of homogenous RCTs
1b	Individual RCT
2a	Systematic review of homogenous cohort studies
2b	Individual cohort study or a low-quality RCT*
3a	Systematic review of homogenous case-control studies
3b	Individual case-control study**
4	Case series/Qualitative studies or low-quality cohort or case-control study***
5	Expert/consensus opinion

**Defined as <80% follow up; **includes survey studies and cross-sectional studies; ***defined as studies without clearly defined study groups.*
RCT, randomized controlled trial.

RESIDENT-AS-TEACHER CURRICULAR CONTENT AND EDUCATIONAL STRATEGIES

Of the reviewed papers, few included a formal needs assessment beyond a review of the literature. Residents' responsibility to teach students, other residents, and other

Table 2. Oxford Centre for Evidence-Based Medicine grades of recommendation.[28]

Grade of Evidence	Definition
A	Consistent Level 1 studies
B	Consistent Level 2 or 3 studies or extrapolations* from Level 1 studies
C	Level 4 studies or extrapolations* from Level 2 or 3 studies
D	Level 5 evidence, or troublingly inconsistent or inconclusive studies of any level

**"Extrapolations" refers to data being used in a situation that has potentially clinically important differences than the original study situation.*

staff is well recognized, as is the need to provide training to prepare residents for their roles as teachers.[29] Reasons for implementing RaT curricula include the following: to teach a skill important to the resident role; meet residents' desire for formal training in education; address regulatory requirements; and prepare trainees for future career roles.[1,30] General curricular goals included improving resident formal and informal teaching skills in both classroom and clinical settings and increasing resident confidence in teaching skills.[29,31] The RaT curricula reviewed contain diverse components. The topics most consistently included in RaT curricula were adult learning theory, creating a positive learning environment and setting objectives, clinical or bedside teaching techniques, classroom teaching techniques, and how to give feedback.[10-12,14,15,29-60]

Adult learning theory—which describes how adults learn best when material is problem-centered, relevant to their work, and when they are involved in the planning and evaluation of their instruction—was a major component of RaT curricula, both as a framework for the curricular development and a topic of instruction for learners.[10,29,31-42] Adult-learning theory was often considered in how RaT curricula was applied.[34,35,61] For example, RaT leaders factored this in for determining the length, frequency, and formatting of these educational sessions within the curricula. [34,35,61]

Many curricula also include adult learning principles as part of their educational content.[11,29, 33,35-42,49,56] Berger et al provided a primer for anesthesiology residents about adult learning principles by having the learners discuss effective and ineffective teaching moments that they remembered in their education.[11] They also had learners review literature on adult learning principles and watch a video demonstration.[11] Similarly, Chee et al had residents identify effective and ineffective teaching strategies observed in video clips to better understand adult learning theory.[35] Choski et al had learners review two papers on adult learning theory to better understand adult education principles.[36] Another group used formal lectures on adult learning theory followed by debriefing.[29] Tang Girdwood et al revised a previous curriculum by removing the PowerPoint lecture on adult learning theory and instead having residents teach the principles of adult learning theory to one another with a faculty facilitator present.[42]

Many RaT curricula sought to teach residents how to set the stage for learning.[11,12,15, 31,32,34-36,38,43-49] Curricular content included how to create a positive learning environment and recognize behaviors that can lead to an environment of harassment or learner mistreatment.[12,31,35,43,44] Understanding how to set goals and expectations with learners to facilitate knowledge and skill acquisition was also an important topic included in RaT curricula.[11,15,31,32,34,36,38,44-49]

Clinical or bedside teaching techniques and tools was another commonly included topic in RaT curricula.[10,14,15,29-31,33,37-42,44,46-48,50-55] One survey study in EM found that 84% of programs reported bedside teaching to be a major focus of their educational curriculum.[32] One of the most frequently included teaching tools was the One-Minute Preceptor.[31,32,37,44,47,51,52.54,57,62] Ahn et al found that 45% of RaT programs in a single specialty incorporated training on the One-Minute Preceptor.[32] In another example, curricula learners were asked to describe the elements of this model, apply the model to a simulated learner's patient presentation, and use the model to assess the learner's knowledge level and identify educational points.[31] Content specific to procedural teaching was included in many curricula. [5,10,11,15, 29,32,33,35-37,41,46,53,55,57,59]

In addition to the clinical setting, many RaT curricula also seek to prepare residents for teaching in the classroom by including content on didactic, small group, and case-based instruction.[11,15,31,32,38,41,42, 45,46,48,50,53,54,56-58] While these content areas were often listed as topics or titles of educational sessions included in curricula, there was little additional description in the included studies as to what these content areas were comprised of. Many curricula also included content on the use of simulation in education.[14,32,42,53,55,57,63]

Feedback was also consistently included in RaT curricula.[8,10-12,14,15,29,31-38,40-44,46-48,50,52,53,55,59,60] One study found that 96% of EM residency programs that had RaT curricula included feedback as a major focus.[32] Specific content areas related to feedback included techniques and components of effective feedback, optimizing the environment for feedback, and how to receive feedback.[33] Curricula often included interactive activities, during which the learners could practice feedback interactions via role-play and debrief with the other learners.[30,33]

Other RaT curricular content included education to augment teaching such as communication skills, professionalism, and how to deal with difficult learning situations.[32,46,50,57,58] Some curricula also included content that could help prepare residents as education professionals such as mentorship and role modeling, curricular design, time management, and learner assessment.[15,32,40,46,57,60,64] We provide a summary of RaT curricular content and educational strategies in Tables 3 and 4.

Table 3. Summary of content in resident-as-teacher curricula.

Curricular Content	Number of Papers	References
Adult learning theory	14	8, 10, 29, 31, 33-42
Assessment of learners	1	60
Case-based instruction	7	8, 11, 42, 46, 54, 57, 58
Clinical/bedside instruction	23	10, 14, 15, 29, 30, 31, 33, 37-42, 44, 46-48, 50-55
Communication skills	4	8, 46, 57, 58
Creating a positive learning environment	5	12, 31, 35, 43, 44
Curriculum design	2	8, 46
Didactic instruction	10	11, 15, 31, 38, 42, 45, 48, 50, 53, 54
Difficult learning situations	2	8, 50
Feedback	28	8, 10-12, 14, 15, 29, 31, 33-38, 40-44, 46-48, 50, 52, 53, 55, 59, 60
Mentorship	2	8, 40
Procedural instruction	16	5, 8, 10, 11, 15, 29, 33, 35-37, 41, 46, 53, 55, 57, 59
Professionalism and role modeling	5	8, 15, 46, 57, 64
Setting goals and expectations	13	8, 11, 15, 31, 34, 36, 38, 44-49
Simulation instruction	7	8, 14, 42, 53, 55, 57, 63
Small group instruction	7	8, 41, 46, 50, 53, 56, 57
Time management	2	8, 46

Table 4. Summary of educational strategies in resident-as-teacher curricula.

Educational Strategy	Number of Papers	References
Didactic lectures	22	5, 7, 8, 12, 17, 29, 33, 37, 38, 42, 47, 57, 58, 64, 71, 75, 86, 87, 93, 95, 103, 104
Direct observation and feedback	13	29, 31, 49, 56, 57, 59, 66, 69, 71, 87, 88, 94, 104
Iterative reminders / staged repetition	4	29, 31, 61, 71
Simulation/role playing	12	12, 14, 31, 37, 57, 64, 69, 70, 75, 87, 88, 91
Small groups	6	12, 36, 37, 56, 69, 93
Virtual sessions/electronic handouts	7	5, 41, 43, 61, 71, 86, 97
Workshops	21	4, 15, 17, 31, 33, 37, 38, 44, 48, 52, 54, 57, 59, 62, 64, 65, 66, 83, 87, 98, 104

Best Practices Recommendations
Resident-as-teacher curricula should include the following:
1. Teaching techniques applicable to both classroom and bedside settings (Level 1, Grade A).
2. Effective feedback techniques that educators can use to provide feedback to learners (Level 1, Grade B).
3. Adult learning theory as part of the framework of the curriculum and its delivery, as well as an educational component of the curriculum. (Level 2, Grade B).

RESIDENT-AS-TEACHER CURRICULAR LOGISTICS AND IMPLEMENTATION

Timing, duration, and frequency of interventions varied greatly among studies and specialties, with no overarching consensus on ideal approaches. The most common approach included single interventions, usually early in intern year or during residency orientation, with most one-day curricula ranging from 4-8 hours.[44, 47, 59, 60, 62, 65-67] According to a landmark paper published by Morrison et al in 2004, the average total time for a RaT curriculum was 11 hours, with their institutional published curriculum lasting for 13 total cumulative hours of longitudinal instruction.[68, 69] Some longitudinal curricula had longer durations including those that spanned the entire length of resident training.[12, 29, 31, 38, 42, 49, 54, 55]

Staffing of the educational sessions was largely by general residency faculty who participated in didactics, mentorship, or evaluations of resident teaching.[56, 58, 59, 62, 69, 70] Sometimes faculty with additional training or specialization in education led or designed the curricula, which included

"educational experts," designated education faculty, and education fellows.[12, 15, 70] Additionally, residents themselves often contributed, including chief residents and teach-the-teacher models.[47, 58]

Several barriers were identified in the implementation of RaT curricula, with the most frequently mentioned being the balance of workload on faculty and residents.[71, 48, 58] Both the total time required for participation and instruction as well as real-time balancing responsibilities of patient care with teaching while working clinically were noted.[37, 57, 72, 73] Additionally, many residents felt it was challenging to teach topics that they themselves still did not feel quite familiar with, even for the sake of experiential learning.[37, 43, 57] Lastly, despite ACGME supportive program requirements, some program directors felt that RaT curricula were not a priority among other competing educational demands.[1, 58,74]

A needs assessment before creating and implementing a RaT curriculum can help confirm interest, elucidate clear, specific program goals for participants, and secure buy-in from faculty and leadership.[37, 56, 58, 75] Buy-in from residents was less challenging, with many residents confirming that they lacked self-confidence in their own teaching abilities, wanted mentorship in this area, and were willing to spend time to gain this experience.[5, 59, 76] Medical students, who along with junior residents, were frequently the recipients of the outcomes of RaT, identified residents as more approachable than faculty and appreciated near-peer teaching.[73, 77-79]

Administration of RaT curricula may be challenging due to the resources required for successful implementation. This includes the number of faculty needed and time for residents to participate in curricular sessions, as well as time to learn and practice these skills while working clinically.[58,70] Through an online survey of 47 residency programs and iterative expert consensus building, McKeon et al proposed the following key components to a successful RaT curriculum: required trainee participation; evaluations and feedback of resident teaching; recognition of excellence through teaching awards; and faculty teaching evaluations linked to annual faculty review but not to salary or promotion.[80] Finally, a RaT curriculum should be iteratively refined to ensure optimization of its content.[42]

Best Practices Recommendations:

1. General residency faculty can teach, provide mentorship, and evaluate participants in RaT curricula (Level 2a, Grade B).
2. Perform a needs assessment prior to implementing a RaT curriculum (Level 3a, Grade B).
3. Identify and address barriers such as time limitations for residents and faculty when implementing a RaT curriculum (Level 4, Grade C).

RaT, resident as teacher.

RESIDENT-AS-TEACHER CURRICULAR OUTCOMES/EVALUATION

When evaluating a RaT program, it is critical to use a robust model, accounting for various inputs, outputs, and outcomes. Examples of relevant program evaluation frameworks include the Kirkpatrick framework, the Logic Model, and CIPP (Context, Input, Process, Products).[81,82] Despite this, most studies did not explicitly state the program evaluation framework they used.

While many studies included only a single or limited number of outcome measures individually, when assessed as a whole, there were a wide range of potential outcomes assessed (Table 5). The most common form of learner assessment was self-surveys of perceived effectiveness after a RaT program.[4-7, 9-12, 14, 31, 33, 35, 39, 42, 44, 48, 49, 51, 54-56, 58, 61, 62, 65, 66, 71, 74, 83-97] A few studies also conducted delayed self-assessments at 3-12 months following RaT course completion.[11,44, 51] One study assessed differences in attitude toward teaching after the course, while others performed knowledge assessment tests.[36, 43, 44] Another study assessed actual use of the skills in subsequent teaching.[52]

Skill assessments were performed using either direct observation or structured assessments in a simulated environment. Several studies directly observed resident teaching, while others video-recorded resident teaching for delayed assessments.[6, 49, 71, 72, 74, 87] Other measures included end-of-shift teaching evaluations completed by faculty.[56, 58, 74] The most common assessment, using simulation, was the Objective Structured Teaching Exercise (OSTE).[6, 9, 36, 38, 41, 46, 49, 54, 63, 71, 74, 84, 87, 92, 96, 98] The OSTEs were incompletely reported; they often ranged from 6-8 stations and were 2-4 hours in length. One study used the Debriefing Assessment for Simulation in Healthcare (DASH) instrument instead of the OSTE.[14] Another assessed both initial and delayed OSTE as part of a randomized trial.[75]

Additional measures were obtained via learners (eg, students, junior residents). Learner assessments used a variety of measures of teaching effectiveness, although most had limited validity evidence.[4, 6, 9, 10, 14, 39, 47, 48, 62, 66, 71, 74, 84-89, 97, 99, 100] One study used the Stanford Faculty Development Program—a 25-item tool assessing learning climate, control of teaching sessions, communicating goals, promoting understanding and retention, evaluation, feedback, and promoting self-directed learning.[47] Another study evaluated the effect of the intervention by comparing course/rotation evaluations from students.[48]

One study focused on the feasibility to inform broader implementation.[38] A few other select studies assessed organizational changes and broader outcomes. Two studies found that the RaT program led to substantive changes, which resulted in residency programs converting to this model going forward.[60,101] Others assessed downstream effects on student learning by comparing student Objective Structured Clinical Examinations (OSCE) or Objective Structured Assessments of Technical Skills (OSATS) between those taught by residents completing the RaT program vs those who did not.[63, 102]

Table 5. Summary of methods of outcome assessments in resident-as-teacher curricula.

Educational Strategy	Number of Papers	References
Observed Structured Teaching Evaluation	12	14, 15, 17, 37, 41, 49, 54, 69, 70, 75, 87, 98
Survey of faculty		
	4	7, 17, 54, 58
Survey of learners		
	36	4, 7, 8, 12, 14, 17, 29, 31, 33, 37, 38, 42, 44, 47, 48, 51, 54, 56, 57, 58, 61, 62, 65, 66, 71, 73, 83, 86, 91, 94, 96, 97, 100, 103-105
Semi-structured interview	1	59

Best Practices Recommendations:

1. RaT outcomes should be assessed using multiple sources of data (Level 1b, Grade B).
2. Use OSTE or direct observation to directly assess RaT outcomes (Level 1b, Grade B).
3. Incorporate delayed assessment for skill retention (Level 1b, Grade B).
4. Use higher level outcome assessments, such as learner evaluations or assessments (Level 3b, Grade B).

RaT, resident as teacher; *OSTE,* Observed Structured Teaching Evaluation.

LIMITATIONS

Although we performed a comprehensive search guided by a medical librarian in conjunction with a bibliographic review and expert consultation to augment content when needed, we used a single search engine, and it is possible that we may have missed some pertinent papers. In instances where evidence in the form of high-quality data was limited or lacking, we relied upon expert opinion and group consensus for the best practice recommendations. Finally, in areas where evidence was not available, we used the consensus from the expertise of our authorship group. While our author group possesses experience in research and scholarship in both RaT curricula and medical education, there was a potential for bias to have been introduced during this process. Therefore, we also sought peer review from the CORD Best Practices Subcommittee and posted it online for open review feedback by the CORD community.

CONCLUSION

Resident-as-teacher curricula are a vital component of graduate medical education training programs. This paper provides guidance on best practices for developing, implementing, and evaluating RaT curricula.

ACKNOWLEDGEMENTS

The authors would like to thank the members of the Council of Residency Directors in Emergency Medicine (CORD) and the members of the CORD Best Practice Committee for their review and feedback of this manuscript. The authors would also like to acknowledge Samantha Kaplan, PhD, Medical Librarian, Duke University, Durham, NC, for her contributions.

Address for Correspondence: Jaime Jordan, MD, MAEd, Oregon Health & Science University, Department of Emergency Medicine, 3181 SW Sam Jackson Park Road, Portland, OR 97239. Email: jaimejordanmd@gmail.com.

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Jordan et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Accreditation Council for Graduate Medical Education. ACGME Common Program Requirements (Residency). 2022. Accessed December 5, 2024. Available at chrome-extension://bdfcnmeidppjeaggnmidamkiddifkdib/viewer.html?file=https://www.acgme.org/globalassets/pfassets/programrequirements/cprresidency_2023.pdf
2. Bordley DR, Litzelman DK. Preparing residents to become more effective teachers: a priority for internal medicine. *Am J Med*. 2000;109(8):693-696.
3. Julian KA, O'Sullivan PS, Vener MH, Wamsley MA. Teaching residents to teach: the impact of a multi-disciplinary longitudinal curriculum to improve teaching skills. *Med Educ Online*. 2007;12(1):4467.
4. Nejad H, Bagherabadi M, Sistani A, Dargahi H. Effectiveness of resident as teacher curriculum in preparing emergency medicine residents for their teaching role. *J Adv Med Educ Prof*. 2017;5(1):21-25.
5. Kobritz M, Demyan L, Hoffman H, Bolognese A, Kalyon B, Patel V. "Residents as teachers" workshops designed by surgery residents for surgery residents. *J Surg Res*. 2022;270:187-194.
6. Wamsley MA, Julian KA, Wipf JE. A literature review of "resident-as-

teacher" curricula: Do teaching courses make a difference? *J Gen Intern Med*. 2004;19(5 Pt 2):574-581.
7. Ratan BM, Johnson GJ, Williams AC, Greely JT, Kilpatrick CC. Enhancing the teaching environment: 3-year follow-up of a resident-led residents-as-teachers program. *J Grad Med Educ*. 2021;13(4):569-575.
8. Ahn J, Golden A, Bryant A, Babcock C. Impact of a dedicated emergency medicine teaching resident rotation at a large urban academic center. *West J Emerg Med*. 2016;17(2):143-148.
9. Post RE, Quattlebaum RG, Benich JJ 3rd. Residents-as-teacher curricula: a critical review. *Acad Med*. 2009;84(3):374-380.
10. Geary AD, Hess DT, Pernar LI. Efficacy of a resident-as-teacher program (RATP) for general surgery residents: an evaluation of 3 years of implementation. *Am J Surg*. 2021;222(6):1093-1098.
11. Berger JS, Daneshpayeh N, Sherman M, et al. Anesthesiology residents-as-teachers program: a pilot study. *J Grad Med Educ*. 2012;4(4):525-528.
12. Santini VE, Wu CK, Hohler AD. Neurology Residents as Comprehensive Educators (Neuro RACE). *Neurologist*. 2018;23(5):149-151.
13. Busari JO, Scherpbier AJ. Why residents should teach: a literature review. *J Postgrad Med*. 2004;50(3):205-210.
14. Miloslavsky EM, Sargsyan Z, Heath JK, et al. A simulation-based resident-as-teacher program: the impact on teachers and learners. *J Hosp Med*. 2015;10(12):767-772.
15. Morrison EH, Rucker L, Boker JR, et al. A pilot randomized, controlled trial of a longitudinal residents-as-teachers curriculum. *Acad Med*. 2003;78(7):722-729.
16. Snell L. The resident-as-teacher: It's more than just about student learning. *J Grad Med Educ*. 2011;3(3):440-441.
17. Hill AG, Yu T, Barrow M, Hattie J. A systematic review of resident-as-teacher programmes. *Med Educ*. 2009;43(12):1129-1140.
18. Chathampally Y, Cooper B, Wood DB, et al. Evolving from morbidity and mortality to a case-based error reduction conference: Evidence-based Best Practices from the Council of Emergency Medicine Residency Directors. *West J Emerg Med*. 2020;21(6):231–41.
19. Wood DB, Jordan J, Cooney R, et al. Conference didactic planning and structure: an Evidence-based Guide to Best Practices from the Council of Emergency Medicine Residency Directors. *West J Emerg Med*. 2020;21(4):999–1007.
20. Parsons M, Bailitz J, Chung AS, et al. Evidence-based interventions that promote resident wellness from the Council of Emergency Residency Directors. *West J Emerg Med*. 2020;21(2):412–22.
21. Parsons M, Caldwell M, Alvarez A, et al. Physician pipeline and pathway programs: an evidence-based guide to best practices for diversity, equity, and inclusion from the Council of Residency Directors in Emergency Medicine. *West J Emerg Med*. 2022;23(4):514–24.
22. Davenport D, Alvarez A, Natesan S, et al. Faculty recruitment, retention, and representation in leadership: an Evidence-Based Guide to Best Practices for Diversity, Equity, and Inclusion from the Council of Residency Directors in Emergency Medicine. *West J Emerg Med*. 2022;23(1):62–71.
23. Gallegos M, Landry A, Alvarez A, et al. Holistic review, mitigating bias, and other strategies in residency recruitment for diversity, equity, and inclusion: an Evidence-based Guide to Best Practices from the Council of Residency Directors in Emergency Medicine. *West J Emerg Med*. 2022;23(3):345–52.
24. Natesan S, Bailitz J, King A, et al. Clinical teaching: An Evidence-based Guide to Best Practices from the Council of Emergency Medicine Residency Directors. *West J Emerg Med*. 2020;21(4):985–98.
25. Estes M, Gopal P, Siegelman JN, et al. Individualized Interactive Instruction: a Guide to Best Practices from the Council of Emergency Medicine Residency Directors. *West J Emerg Med*. 2019;20(2):363–8.
26. Gottlieb M, King A, Byyny R, et al. Journal club in residency education: an Evidence-based Guide to Best Practices from the Council of Emergency Medicine Residency Directors. *West J Emerg Med*. 2018;19(4):746–55.
27. Natesan S, Jordan J, Sheng A, et al. Feedback in medical education: An Evidence-based Guide to Best Practices from the Council of Residency Directors in Emergency Medicine. *West J Emerg Med*. 2023;24(3):479-494.
28. Phillips R, Ball C, Sackett D. Oxford Centre for Evidence-Based Medicine: Levels of Evidence. CEBM: Centre for Evidence-Based Medicine. 2021. Accessed December 5, 2024. Available at: https://www.cebm.ox.ac.uk/resources/levels-of-evidence/ocebm-levels-of-evidence
29. Nguyen S, Cole KL, Timme KH, Jensen RL. Development of a residents-as-teachers curriculum for neurosurgical training programs. *Neurosurgical focus*. 2022;53(2):E6.
30. Al Achkar M, Hanauer M, Morrison EH, Davies MK, Oh RC. *Adv Med Educ Pract*. 2017;8:299-306.
31. Rowat J, Johnson K, Antes L, White K, Rosenbaum M, Suneja M. Successful implementation of a longitudinal skill-based teaching curriculum for residents. *BMC Med Educ*. 2021;21(1):346
32. Ahn J, Jones D, Yarris L, Fromme H, Yarris LM, Fromme HB. A national needs assessment of emergency medicine resident-as-teacher curricula. *Intern Emerg Med*. 2017;12(1):75-80.
33. Anderson MJ, Ofshteyn A, Miller M, Ammori J, Steinhagen E. "Residents as teachers" workshop improves knowledge, confidence, and feedback skills for general surgery residents. *J Surg Educ*. 2020;77(4):757-764.
34. Bensinger LD, Meah YS, Smith LG. Resident as teacher: the Mount Sinai experience and a review of the literature. *Mt. Sinai J Med*. 2005;72(5):307-311.
35. Chee YE, Newman LR, Loewenstein JI, Kloek CE. Improving the teaching skills of residents in a surgical training program: results of the pilot year of a curricular initiative in an ophthalmology residency program. *J Surg Educ*. 2015;72(5):890-897.
36. Chokshi BD, Schumacher HK, Reese K, et al. A "Resident-as-teacher" curriculum using a flipped classroom approach: Can a model designed for efficiency also be effective? *Acad Med*. 2017;92(4):511-514.

37. Cullimore AJ, Dalrymple JL, Dugoff L, et al. The obstetrics and gynaecology resident as teacher. *J Obstet Gynaecol Can*. 2010;32(12):1176-1185.
38. Friedman S, Moerdler S, Malbari A, Laitman B, Gibbs K. The Pediatric Resident Teaching Group: the development and evaluation of a longitudinal resident as teacher program. *Med Sci Educ*. 2018;28(4):619-624.
39. Langer AL, Bernard S, Block BL. Two-week resident-as-teacher program may improve peer feedback and online evaluation completion. *Med Sci Educ*. 2018;28(4):633-637.
40. Mendoza D, Peterson R, Ho C, Harri P, Baumgarten D, Mullins ME. Cultivating future radiology educators: development and implementation of a clinician-educator track for residents. *Acad Radiol*. 2018;25(9):1227-1231.
41. Ricciotti HA, Freret TS, Aluko A, McKeon BA, Haviland MJ, Newman LR. Effects of a short video-based resident-as-teacher training toolkit on resident teaching. *Obstet Gynecol*. 2017;130:36S-41S.
42. Tang Girdwood S, Treasure J, Zackoff M, Klein M. Implementation, evaluation, and improvement of pediatrics residents-as-teachers elective through iterative feedback. *Med Sci Educ*. 2019;29(2):375-378.
43. Bettendorf B, Quinn-Leering K, Toth H, Tews M. Teaching when Time Is Limited: a Resident and Fellow as Educator Video Module. *Med Sci Educ*. 2019;29(3):631-635.
44. Tipton AE, Ofshteyn A, Anderson MJ, et al. The impact of a "residents as teachers" workshop at one year follow-up. *Am J Surg*. 2022;224(1 Pt B):375-378.
45. Gaba ND, Blatt B, Macri CJ, Greenberg L. Improving teaching skills in Obstet Gynecol residents: evaluation of a residents-as-teachers program. *Am J Obstet Gynecol*. 2007;196(1):87.e1-7.
46. Messman A, Kryzaniak SM, Alden S, Pasirstein MJ, Chan TM. Recommendations for the development and implementation of a residents as teachers curriculum. *Cureus*. 2018;10(7):e3053.
47. Moser EM, Kothari N, Stagnaro-Green A. Chief residents as educators: an effective method of resident development. *Teach Learn Med*. 2008;20(4):323-328.
48. Ostapchuk M, Patel PD, Hughes Miller K, Ziegler CH, Greenberg RB, Haynes G. Improving residents' teaching skills: a program evaluation of residents as teachers course. *Med Teach*. 2010;32(2):e49-e56.
49. Zackoff M, Jerardi K, Unaka N, Sucharew H, Klein M. An Observed Structured Teaching Evaluation demonstrates the impact of a resident-as-teacher curriculum on teaching competency. *Hosp Pediatr*. 2015;5(6):342-347.
50. Achkar MA, Davies MK, Busha ME, Oh RC. Resident-as-teacher in family medicine: a CERA survey. *Fam Med*. 2015;47(6):452-458.
51. Burgin S, Zhong CS, Rana J. A resident-as-teacher program increases dermatology residents' knowledge and confidence in teaching techniques: A pilot study. *J Am Acad Dermatol*. 2020;83(2):651-653.
52. Burke S, Schmitt T, Jewell C, Schnapp B. A novel virtual emergency medicine residents-as-teachers (RAT) curriculum. *J Educ Teach Emerg Med*. 2021;6(3).
53. Farrell SE, Pacella C, Egan D, et al. Resident-as-teacher: a suggested curriculum for emergency medicine. *Acad Emerg Med*. 2006;13(6):677-679.
54. Liang JF, Cheng HM, Huang CC, Yang YY, Chen CH. Lessons learned from a novel 3-year longitudinal stepwise "residents-as-teachers" program. *J Chin Med Assoc*. 2023;86(6):577-583.
55. Seelig S, Bright E, Bod J, et al. Educating future educators-resident distinction in education: a longitudinal curriculum for physician educators. *West J Emerg Med*. 2021;23(1):100-102.
56. Frey-Vogel A. A resident-as-teacher curriculum for senior residents leading morning report: a learner-centered approach through targeted faculty mentoring. *MedEdPORTAL*. 2020;16:10954.
57. Fromme HB, Whicker SA, Paik S, et al. Pediatric resident-as-teacher curricula: a national survey of existing programs and future needs. *J Grad Med Educ*. 2011;3(2):168-175.
58. Pien LC, Taylor CA, Traboulsi E, Nielsen CA. A pilot study of a "resident educator and life-long learner" program: using a faculty train-the-trainer program. *J Grad Med Educ*. 2011;3(3):332-336.
59. McKinley SK, Cassidy DJ, Sell NM, et al. A qualitative study of the perceived value of participation in a new department of surgery research residents-as-teachers program. *Am J Surg*. 2020;220(5):1194-1200.
60. Roberts KB, DeWitt TG, Goldberg RL, Scheiner AP. A program to develop residents as teachers. *Arch Pediatr Adolesc Med*. 1994;148(4):405-410.
61. Watkins AA, Gondek SP, Lagisetty KH, et al. Weekly e-mailed teaching tips and reading material influence teaching among general surgery residents. *Am J Surg*. 2017;213(1):195-201.e3.
62. Ofshteyn A, Bingmer K, Tseng E, et al. Effect of "residents as teachers" workshop on learner perception of trainee teaching skill. *J Surg Res*. 2021;264:418-424.
63. York-Best C, Bengtson J, Stagg A. A Simulation-Based Resident as Surgical Teacher (RAST) program. *J Grad Med Educ*. 2017;9(3):382-384.
64. Patocka C, Meyers C, Delaney JS. Residents-as-teachers: a survey of Canadian emergency medicine specialty programs. *CJEM*. 2010;12(3):249.
65. Aiyer M, Woods G, Lombard G, Meyer L, Vanka A. Change in residents' perceptions of teaching: following a one day "residents as teachers" (RasT) workshop. *South Med J*. 2008;101(5):495-502.
66. Ryg PA, Hafler JP, Forster SH. The efficacy of residents as teachers in an ophthalmology module. *J Surg Educ*. 2016;73(2):323-328.
67. Wipf JE, Pinsky LE, Burke W. Turning interns into senior residents: preparing residents for their teaching and leadership roles. *Acad Med*. 1995;70(7):591-596.
68. Morrison EH, Friedland JA, Boker J, Rucker L, Hollingshead J, Murata P. Residents-as-teachers training in U.S. residency programs and offices of graduate medical education. *Acad Med*. 2001;76(10 Suppl):S1-4.
69. Morrison EH, Rucker L, Boker JR, et al. The effect of a 13-hour curriculum to improve residents' teaching skills: a randomized trial. *Ann Intern Med*. 2004;141(4):257-263.
70. Ricciotti HA, Dodge LE, Head J, Atkins KM, Hacker MR. A novel

resident-as-teacher training program to improve and evaluate Obstet Gynecol resident teaching skills. *Med Teach*. 2012;34(1):e52-7.
71. Geary A, Hess DT, Pernar LIM. Resident-as-teacher programs in general surgery residency - a review of published curricula. *Am J Surg*. 2019;217(2):209-213.
72. Ilgen JS, Takayesu JK, Bhatia K, et al. Back to the bedside: the 8-year evolution of a resident-as-teacher rotation. *J Emerg Med*. 2011;41(2):190-195.
73. Kaji A, Moorehead JC. Residents as teachers in the emergency department. *Ann Emerg Med*. 2002;39(3):316-318.
74. Bree KK, Whicker SA, Fromme HB, Paik S, Greenberg L. Residents-as-teachers publications: What can programs learn from the literature when starting a new or refining an established curriculum? *J Grad Med Educ*. 2014;6(2):237-248.
75. Dunnington GL, DaRosa D. A prospective randomized trial of a residents-as-teachers training program. *Acad Med*. 1998;73(6):696-700.
76. Benè KL, Bergus G. When learners become teachers: a review of peer teaching in medical student education. *Fam Med*. 2014;46(10):783-7.
77. Minor S, Poenaru D. The in-house education of clinical clerks in surgery and the role of housestaff. *Am J Surg*. 2002;184(5):471-5.
78. Weisgerber M, Flores G, Pomeranz A, Greenbaum L, Hurlbut P, Bragg D. Student competence in fluid and electrolyte management: the impact of various teaching methods. *Ambul Pediatr.* 2007;7(3):220–225.
79. Moore J, Parsons C, Lomas S. A resident preceptor model improves the clerkship experience on general surgery. *J Surg Educ*. 2014;71(6):e16-8.
80. McKeon BA, Ricciotti HA, Sandora TJ, et al. A consensus guideline to support resident-as-teacher programs and enhance the culture of teaching and learning. *J Grad Med Educ*. 2019;11(3):313-318.
81. Frye AW, Hemmer PA. Program evaluation models and related theories: AMEE guide no. 67. *Med Teach*. 2012;34(5):e288-e299.
82. Hosseini S, Yilmaz Y, Shah K, et al. Program evaluation: an educator's portal into academic scholarship. *AEM Educ Train*. 2022;6(Suppl 1):S43-S51.
83. Donovan A. Radiology resident teaching skills improvement: impact of a resident teacher training program. *Acad Radiol*. 2011;18(4):518-524.
84. Gill DJ, Frank SA. The neurology resident as teacher: evaluating and improving our role. *Neurology*. 2004;63(7): 1334-1338.
85. Johnson KM, Rowat J, Suneja M. A 3-year rolling teaching skills curriculum for all residents in the ambulatory block. *J Gen Intern Med*. 2018;33(2):675.
86. Tischendorf JS, MacDonald M, Harer MW, Pittner-Smith CA, Zelenski AB, Johnson SK. Bridging undergraduate and graduate medical education: a resident-as-educator curriculum embedded in an internship preparation course. *Wis Med J.* 2020;119(4):278-281.
87. Dewey CM, Coverdale JH, Ismail NJ, et al. Residents-as-teachers programs in psychiatry: a systematic review. *Can J Psychiarty.* 2008;53(2):77-84.
88. Chochol MD, Gentry M, Hilty DM, McKean AJ. Psychiatry Residents as Medical Student Educators: a Review of the Literature. *Acad Psychiatry.* 2022;46(4):475-485.
89. James MT, Mintz MJ, McLaughlin K. Evaluation of a multifaceted "resident-as-teacher" educational intervention to improve morning report. *BMC Med Educ*. 2006;6:20.
90. Haghani F, Eghbali B, Memarzadeh M. Effects of "teaching method workshop" on general surgery residents' teaching skills. *J Educ Health Promot*. 2012;1:38.
91. Humbert AJ, Pettit KE, Turner JS, Mugele J, Rodgers K. Preparing emergency medicine residents as teachers: clinical teaching scenarios. *MedEdPORTAL.* 2018;14:10717.
92. York-Best C, Bengtson J, Stagg A. Laparoscopic salpingectomy: a simulation-based resident as surgical teacher (RAST) program. *Obstet Gynecol*. 2016;128:63S.
93. Katzelnick DJ, Gonzales JJ, Conley MC, Shuster JL, Borus JF. Teaching psychiatric residents to teach. *Acad Psychiatry*. 1991;15(3):153-159.
94. Marcus CH, Newman LR, Winn AS, et al. TEACH and repeat: Deliberate practice for teaching. *Clin Teach*. 2020;17(6):688-694.
95. Grady-Weliky TA, Chaudron LH, Digiovanni SK. Psychiatric residents' self-assessment of teaching knowledge and skills following a brief "psychiatric residents-as-teachers" course: a pilot study. *Acad Psychiatry*. 2010;34(6):442-444.
96. Dannaway J, Ng H, Schoo A. Literature review of teaching skills programs for junior medical officers. *Int J Med Educ*. 2016;7:25-31.
97. Geary AD, Hess DT, Pernar LIM. Resident-as-teacher programs in general surgery residency: context and characterization. *J Surg Educ*. 2019;76(5):1205-1210.
98. Zackoff MW, Real FJ, DeBlasio D, et al. Objective assessment of resident teaching competency through a longitudinal, clinically integrated, resident-as-teacher curriculum. *Acad Pediatr*. 2019;19(6):698-702.
99. Hill AG, Srinivasa S, Hawken SJ, et al. Impact of a Resident-as-teacher workshop on teaching behavior of interns and learning outcomes of medical students. *J Grad Med Educ*. 2012;4(1):34-41.
100. Loo BKG, Thoon KC, Tan JHY, Nadua KD, Chow CCT. Supporting paediatric residents as teaching advocates: changing students' perceptions. *Asia Pacific Scholar*. 2020;5(3):62-70.
101. Litzelman DK, Stratos GA, Skeff KM. The effect of a clinical teaching retreat on residents' teaching skills. *Acad Med.* 1994;69:433–4.
102. Thomas PS, Harris P, Rendina N, Keogh G. Residents as teachers: outcomes of a brief training programme. *Educ Health.* 2002;15:71–8.
103. Hoffman LA, Furman DT Jr, Waterson Z, Henriksen B. A novel resident-as-teacher curriculum to improve residents' integration into the clinic. *PRiMER*. 2019;3:9.
104. Mann KV, Sutton E, Frank B. Twelve tips for preparing residents as teachers. *Med Teach*. 2007;29(4):301-306.
105. Fakhouri Filho SA, Feijo LP, Augusto KL, Nunes M do PT. Teaching skills for medical residents: Are these important? A narrative review of the literature. *Sao Paulo Med J*. 2018;136(6):571-578.

A Qualitative Study of Senior Residents' Strategies to Prepare for Unsupervised Practice

Max Griffith, MD*
Alexander Garrett, MD*
Bjorn K. Watsjold, MD, MPH*
Joshua Jauregui, MD, MHPE*
Mallory Davis, MD, MPH†
Jonathan S. Ilgen MD, PhD*

*University of Washington, Department of Emergency Medicine, Seattle, Washington
†University of Michigan, Ann Arbor, Department of Michigan, Ann Arbor, Michigan

Section Editor: Abra Fant, MD
Submission history: Submitted July 11, 2025; Revision received October 10, 2025; Accepted October 13, 2025
Electronically published November 26, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI 10.5811/westjem.48914

Introduction: As emergency medicine (EM) residents prepare for the transition into unsupervised practice, their focus shifts from demonstrating competencies within familiar training environments to anticipating their new roles and responsibilities as attending physicians, often in unfamiliar settings. Using the self-regulated learning framework, we explored how senior EM residents proactively identify goals and enact learning strategies leading up to the transition from residency into unsupervised practice.

Methods: In this study we used a constructivist grounded theory approach, interviewing EM residents in their final year of training at two residency programs. Using the self-regulated learning framework as a sensitizing concept for analysis, we conducted inductive, line-by-line coding of interview transcripts and grouped codes into categories. Theoretical sufficiency was reached after 12 interviews, with four subsequent interviews producing no divergent or disconfirming examples.

Results: We interviewed16 senior residents about their self-regulated learning approaches to preparing for unsupervised practice. Participants identified two types of gaps that they sought to address prior to entering practice: knowledge/skill gaps, and autonomy gaps. We employed specific workplace learning strategies to address each type of gap, which we have termed cherry-picking, case-based hypotheticals, parachuting, and making the call, and reflection on both internal and external sources of feedback to assess the effectiveness of these learning strategies. This study presents participants' identification of gaps in their residency training, their learning strategies, and reflections as cyclical processes of self-regulated learning.

Conclusion: In their final months of training EM residents strategically leverage learning strategies to bridge gaps between their self-assessed capabilities and those they anticipate needing to succeed in unsupervised practice. These findings show that trainees have agency in how they use goal setting, strategic actions, and ongoing reflection to prepare themselves for unsupervised practice. Our findings also suggest tailored approaches whereby programs can support learning experiences that foster senior residents' agency when preparing for the challenges of future practice. [West J Emerg Med. 2025;26(6)1510–1518.]

INTRODUCTION

Competency-based medical education frameworks provide scaffolding and accountability to ensure that emergency medicine (EM) trainees develop the necessary knowledge and skills for unsupervised practice.[1,2] While competency-based medical education frameworks provide a roadmap for residents to deliberately practice the core elements of EM, graduates of EM training programs often

lament the inevitability of encountering new challenges when entering practice.[3,4] This suggests that the training experiences that advance residents' competencies (what a resident does to demonstrate their abilities) must be done in conjunction with efforts to advance residents' capabilities (the things they can think or do in future practice.)[5] While competencies are often embedded in the tools that training programs use to assess residents,[1,6,7] capability development requires trainees to engage in dynamic self-assessment[8] to consider what they can work on now to prepare themselves for future transitions. A capability approach looks beyond training residents who are simply competent, aiming instead to develop trainees who can self-diagnose their future learning needs and enact learning strategies to achieve their goals.[9–11]

Self-regulated learning (SRL) provides a framework to study how senior residents approach workplace learning to prepare for their transitions into unsupervised practice.[12] The SRL theory proposes that individuals are "metacognitively, motivationally, and behaviorally active participants in their own learning process."[13] This provides a structure to consider how residents might assess their abilities and modulate their activities during training.[14] These SRL behaviors are often depicted as a cycle whereby individuals set goals, employ learning strategies to attain these goals, and reflect on their progress.[14] This cycle is context-dependent, shaped by learner characteristics (eg, knowledge, prior experiences, emotions, and confidence) as well as by the learning environment (structure, supports, and cultural expectations).[15] Learner-related factors such as autonomy, efficacy, and accumulated experience have been shown to support engagement with SRL,[16] suggesting that residents in the final months of training have nuanced and mature self-regulated learning habits.

The end of residency training is a compelling period to examine SRL as it relates to capability development. As residents prepare for the transition into unsupervised practice, their focus shifts from demonstrating advanced competencies within familiar training environments[7] to anticipating their performance with new roles and responsibilities as attending physicians, often in unfamiliar practice environments.[17–21] In recent work exploring how senior EM residents conceptualized their preparedness for unsupervised practice, we found that trainees were cognizant of the inevitable mismatch between what they learned in training and what they would be expected to do in unsupervised practice.[3]

We were struck by trainees' sense of agency in their reflections,[22] particularly by how they set goals and leveraged their learning environments to create learning strategies that addressed their anticipated future practice needs. Recognizing that these findings have not been described previously in the literature, we returned to our data using the lens of SRL to explore how senior residents proactively identified goals and enacted learning strategies specific to their transitions from residency into unsupervised practice. By elaborating these strategies, we hope to provide insights that educators can use to tailor their support for senior trainees during these important transition periods.

Population Health Research Capsule

What do we already know about this issue?
Emergency medicine (EM) residency graduates are often anxious about the unfamiliar clinical problems that they will encounter in unsupervised practice.

What was the research question?
What workplace learning strategies do EM senior residents use to prepare themselves for unsupervised practice?

What was the major finding of the study?
We describe self-regulated learning strategies: cherry picking, case-based hypotheticals, parachuting, and making the call.

How does this improve population health?
These learning strategies can improve new physicians' preparedness to treat patients without supervision in a variety of clinical settings.

METHODS

We chose a constructivist grounded theory approach for this qualitative study, a methodology appropriate to study a complex social process about which relatively little is already known.[23] We assembled a research team with a range of expertise and experiences, recognizing the importance of subjectivity in our processes of building theory through analyses of our participants' narratives.[24] The author group consisted of emergency clinician educators from both participating institutions, all of whom regularly supervise senior residents. We approached this study with an understanding of the challenges and affordances of the emergency department (ED) learning environment. At the time of data collection, three of the authors (MG, AG, MD) were each one year removed from residency, which allowed them to reflect on their recent training experiences as well as the challenges of working as new attending physicians.

Conceptual framework

This study is part of a larger program of research about how senior residents prepare themselves for unsupervised practice. In prior work,[3] we described how senior residents adopted a future-oriented, capability approach to workplace

learning,[5] using past training experiences as starting points to engage with unforeseen problems in practice. Our participants recognized that uncertainty and unfamiliar problems were inevitabilities of future practice, and defined preparedness in terms of the skills and approaches that would enable them to capably adapt to unforeseen challenges. This understanding led us to consider how senior residents might proactively use their final months of training to further these goals of adaptability[25,26] and capability development.[5] For this study, we used the SRL framework as a sensitizing concept for additional analysis, focusing on how participants described their dynamic processes of setting goals, strategizing for workplace learning, and monitoring their progress.[13,14,27,28]

Setting, Population and Sampling Strategy

We recruited EM residents in their final year of training at two four-year residency programs, each housed within large, academic healthcare centers with Level I trauma designation and rotations between multiple clinical sites. Fourth-year trainees in each program work a combination of "pre-attending" shifts, in which they supervise junior trainees with an attending physician also present, and primary shifts, during which they manage patients directly with attending supervision. We chose this cohort because of their proximity to their transition into unsupervised practice as well as their familiarity with their residency learning environments accumulated over three prior years of training. We sampled from geographically distinct areas (Midwest and Western United States) to account for local practice patterns and workplace cultures.

Interviews occurred between April–June 2023, when participants were still immersed in training but had solidified their immediate post-residency career plans. Email invitations were sent to all 28 eligible residents, with assurances that data would be deidentified before analysis and that participation would have no bearing on their standing within their programs. Interviews were scheduled in the order that residents responded. Participants were reimbursed with a $100 gift card. This study was reviewed and deemed exempt by institutional review boards at both sites.

Procedures

The principal investigator (MG) used videoconferencing software (Zoom Video Communications, Inc., San Jose, CA) to conduct individual virtual interviews. We piloted the interview guide (Supplemental material) with two senior trainees not participating in this study, and modified questions for clarity. We then conducted semi-structured interviews, asking participants about their career plans after residency, what it means to be "prepared" for unsupervised practice, and what challenges they anticipated as they entered work in new contexts. We probed about how residents developed learning goals and enacted specific workplace learning strategies to prepare themselves for the experiences they anticipated in unsupervised practice. We used a professional transcription service (Rev.com. Inc., Austin, TX) to transcribe recordings, which MG then deidentified and checked for accuracy prior to analysis by the group.

Analysis

The entire research team coded four initial interview transcripts line-by-line to inductively develop a preliminary codebook, after which we agreed on a focused set of codes for the remaining data. Two investigators (MG and AG) then coded all transcripts with Dedoose (Social Cultural Research Consultants, LLC, Los Angeles, CA), using memos to keep track of conflicting examples or ideas requiring more exploration, and meeting frequently to discuss coding discrepancies. The entire group met periodically to resolve differing interpretations of the data, discuss relationships between codes, and group codes into categories. Drawing from these categories, we constructed theory as defined by Charmaz: to "present arguments about the world and the relationships within it." [28,29(p128)] Our coding framework sufficiently captured our construct of interest after 12 interviews. Finding no divergent or disconfirming examples in four subsequent interviews, we deemed our dataset sufficient for the study's aims.[30]

RESULTS

We interviewed 16 EM senior residents (ten and six from each respective residency program; nine women and seven men). These residents had accepted positions to work clinically at a variety of community, academic, county, and community-academic hybrid sites, often splitting time between multiple clinical practice settings. Three participants were entering EM fellowships but with clinical roles as attending physicians. One participant was slated to start work as a critical care fellow, albeit with opportunities to work unsupervised shifts in the hospital's ED. Across these interviews, participants shared a view that the resources, practice patterns, and pathologies characteristic of their training sites did not reflect clinical practice in most other settings. This perception shaped their learning goals for the final months of training, motivating them to develop learning strategies that bridged gaps between the capabilities they had developed in their existing training contexts and the skills they anticipated needing in unsupervised practice.

We identified learning strategies in our initial coding of participants' stories. We then applied SRL as a theoretical lens, which allowed us to arrange those strategies into cycles involving an initial planning phase, in which participants self-identified gaps, an action phase where they deployed learning strategies to address these gaps, and a phase of reflection on their progress. Finally, we divided these cycles as we recognized that they addressed two types of gaps—knowledge/skill gaps and autonomy gaps—to represent how our participants engaged in SRL cycles as a response to their impending clinical transitions.

Gaps in Participants' Knowledge and Skills

In reflecting on their readiness to enter unsupervised practice, participants identified crucial gaps in their abilities to understand and manage unfamiliar clinical problems. These perceived gaps stemmed from limitations to the pathologies and patient complaints that they were exposed to during training, due to the time-limited nature of training as well as the affordances and limitations of working at an academic healthcare center. Many participants anticipated managing conditions with less input from specialists than they did at their current academic healthcare centers and worried they might be insufficiently prepared to manage these problems on their own. As Participant 11 reflected, "we just have so many consultants …we take a backseat on a lot of things." Participants also worried that structures within their training environments—such as the tendency for nurse practitioners or physician assistants to care for patients with low-acuity complaints— buffered them from the realities of community practice:

> I feel like we often are protected from the urgent care complaints… just because we have great mid-levels, and also it just doesn't feel like that type of community medicine comes in that much. (Participant 6)

Learning Strategies: Cherry-picking and Case-based Hypotheticals

Participants adopted two strategies to address perceived knowledge and skill gaps in their training. For each, they strategically leveraged the resources of their training environments to build confidence that they could handle the anticipated challenges of their future practice. First, participants described acts of cherry- picking, selectively engaging with clinical tasks that addressed gaps in their knowledge and skills. They seemed to view their last months of training as an opportunity to seek out pathologies and procedures in areas where they felt inadequately prepared, at times prioritizing these over tasks that they viewed as less educationally enriching. For example, after self-identifying a need for more experience with orthopedic injuries, Participant 15 described an instance in which they intentionally sought out orthopedic experiences on shift.

> "I knew there was a bunch of ortho stuff going into the department, and so I just said to [my attending] … 'you won't see me for a while. I'm going to spend the next few hours doing ortho stuff.' And, so, I just went along and properly learned some better techniques."

Yet residents often discussed the difficult balance between cherry-picking and expectations of patient throughput. Several participants noted that they had not felt empowered to focus on gaps in their learning until the final years of their training. They attributed this greater sense of agency to their familiarity with the clinical workflow, their comfort with their clinical supervisors, and the sense of urgency imparted by the upcoming transition to unsupervised practice. As Participant 6 explained:

> I was able to recognize that, after I don't know how many years … if the patient needs to be seen because they're super sick, then happily I'll see them and I'll see them fast. But you know, the eighth abdominal pain can sit for 20 minutes while I focus on the critical care or the pathology that I don't really understand or recognize yet, because that's more important.

A second strategy that participants used to address their gaps in knowledge and skills was case-based hypotheticals, moments when they deliberately slowed down and stretched a clinical experience to consider alternative approaches or dimensions they might face. Participant 7 used the expression "mental war-gaming" to describe their process of thinking through a range of case-specific "if this happens, what would I do?" hypotheticals with the help of their supervisor. Another participant elaborated on how considering hypotheticals with trusted supervisors helped them to feel more confident tackling novel problems in unsupervised practice:

> Just trying to go through every line of how this [case] could turn out, so that when it does turn out that way [next year], I have a good frame of reference of what the attending would do … I think that just doubles your number. You're essentially creating a new patient in your mind, right? … It's not the unknown anymore." (Participant 6)

Reflection: Programmatic Feedback

Participants often struggled with the poor alignment of external formative feedback sources—such as procedure logs, competency metrics, standardized tests, and evaluations from attendings—with their self-assessed knowledge and skills gaps. Despite this, they relied on programmatic assessment for feedback on these gaps and used it to calibrate their self-assessments. Participant 8 described the trust they placed in their program's assessment processes:

> I think you just have to really rely on the system that's in place, and you have to trust the program leadership and the attendings to call you out when they think you are not ready in something.

Although these were recognized to be imperfect sources of feedback, many felt that nationally recognized milestone assessments and standardized tests were the best available substrate to reflect on their abilities to apply knowledge and skills in unsupervised practice.

> I think to be a practicing emergency physician...you have to be able to pass the boards… Do you have enough information in your head that you're not going to miss something glaringly obvious because you don't know it? (Participant 14)

Gaps in Participants' Autonomy

As part of their transition to the attending physician role, participants anticipated a major leap in autonomy, with expectations of practicing independently and bearing the ultimate responsibility for decisions. Working without supervisory guidance was an anticipated source of stress and anxiety, as Participant 13 reflected:

> I am going to be the adult in the room making all of these decisions. I don't necessarily have the attending to say, 'I'm not sure, let me go ask them.' …Every call ... I'll be the final one making it.

Confidence was frequently mentioned as an attribute needed for unsupervised practice, on par with any knowledge or skill set. Thus, participants strategized ways that they could use their workplace learning to build confidence in the decision-making they would need when working without supervision.

Learning Strategies: Parachuting and Making the Call

Participants adopted two learning strategies to engender confidence that they could engage in new tasks without the input of supervisors. They pushed themselves to expand their comfort zones in two ways: by trying new management approaches with supervisory support; or by deliberately seeking experiences where supervisory support felt absent. First, participants described acts of parachuting, deliberately seeking to safely try new things while still having the backstop provided by their clinical supervisors. They sought opportunities to trial unfamiliar approaches to patient care, for example treating with a medication they had little experience with or attempting a procedural method that they had not tried before, viewing these instances as moments when they could "widen [their] experience before getting too set in one way" (Participant 7). Participants were able to test their limits or attempt new things with reassurances that supervisors were available to help. Participant 5 described this support structure in the following way:

> [T]his parachute that you know is there…no matter how much flexibility and how much autonomy our attendings give us, it's very clear that there's somebody to catch you if you fall.

Second, participants described deliberate efforts to adopt a mindset of working without supervisory support, pushing themselves to engage with high-stakes decisions before their supervisors provided input. Participant 13 described stroke evaluations as moments when they found opportunities to "make the call" with no supervisory guidance:

> I try to jump on [stroke evaluations], whether or not the attending is there yet, and kind of make a call before that support comes in.

Making the call in this manner fostered self-reliance, and participants expected that experiences like this would lessen the stress of similar decisions in future unsupervised practice:

> Whenever I come up with a patient and I'm like, 'Oh, I need to ask about what to do.' Then I just pause. I'm like, 'No, I'm not going to ask. I'm going to figure out what I'm going to do and then present it that way.' (Participant 2)

In addition to finding opportunities to practice their independent thinking during supervised shifts, several participants sought out authentic experiences of autonomy through moonlighting (working physician shifts for pay outside of their regular training, often unsupervised) to build confidence at the end of training.

Reflection: Internal Emotions and External Standards

Gauging whether they were ready for increased autonomy was difficult for participants, and they struggled to link their readiness to existing performance metrics within their residency training structures. Participants instead reflected on their emotional reactions in the workplace, as well as implicit feedback from their clinical supervisors as more holistic measures of whether they could be confidently autonomous. During high-stakes scenarios, participants took stock of their own internal emotional states, using these reactions as a measuring stick for whether they could handle the pressures of unsupervised practice. Participant 3 reflected on their comfort level while leading a pediatric code as evidence that they were ready to handle the increased autonomy:

> Yeah, you know I felt uncomfortable in regard to it being a 3-year-old and it being stressful, but I didn't feel out of my depth by any means. I felt like if that showed up at [a community hospital], even without a ton of surgeons, I felt like I would have been able to handle it.

Residents also cited their supervisors as external reference points that helped them reflect on their abilities to work autonomously. They described a practice of comparing their management plans to those of their supervisors, using instances of alignment or misalignment as ongoing sources of feedback. Working alongside attending physicians provided opportunities to identify a range of acceptable practice and evaluate decision-making against a trusted standard, either reaffirming or calling into question their sense of practice readiness.

> "I am just quizzing myself against the attendings… you're ready for more independent practice when all of your care decisions seem to fall within the range of people that you work with." (Participant 9)

DISCUSSION

Senior residents in this study described a range of strategies that they used to prepare themselves for unsupervised practice. Using SRL as a framework to interrogate these strategies, we showed how residents identified specific knowledge and skill gaps and the need to build confidence in their ability to work autonomously. They then strategically leveraged their familiarity with their training environments toward. tailored approaches that addressed these self-identified areas of development. To reflect on whether their learning strategies were effective, they looked to programmatic feedback, their own emotions, or their performance relative to their supervisors, using these sources of feedback to prepare themselves for new cycles of learning. Taken together, these acts of gap identification, strategic action, and reflection provided unique cycles of SRL specific to their upcoming transitions into practice (Figure).

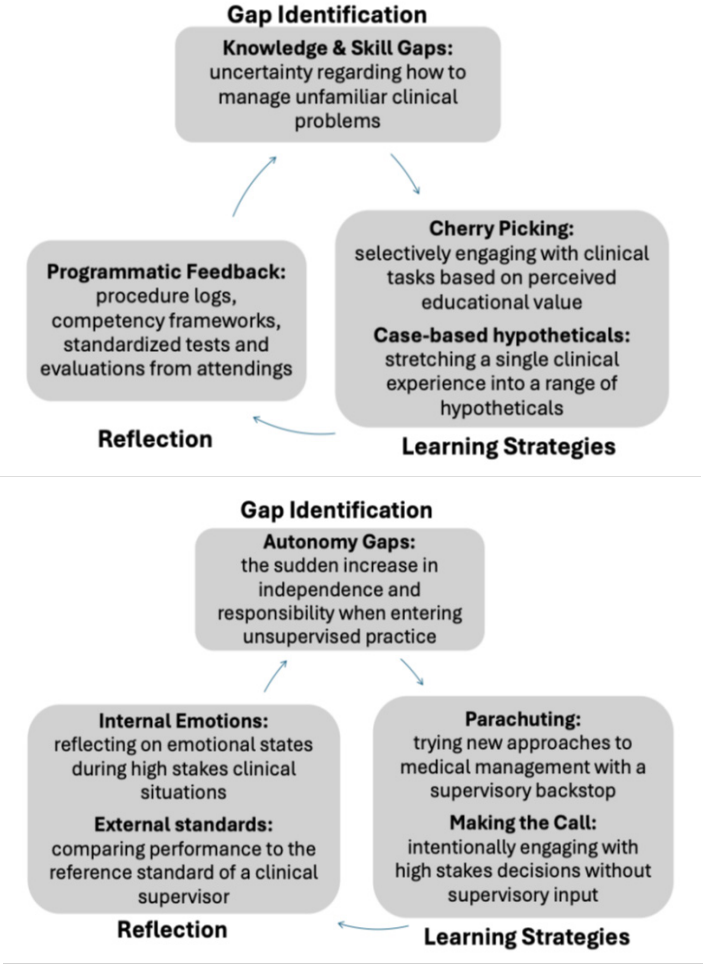


Figure. Gap identification, learning strategies, and means of reflection described by participants in a study of how senior residents in emergency medicine programs prepare for independent practice.

This study adds to previous research on transitions into practice, which has historically focused on perspectives of attending physicians who have already entered their new professional roles.[18,31-35] Teunissen and Westerman have argued that "a transition is not a moment, but rather a dynamic process,"[36(p45)] encompassing the periods both leading up to and succeeding an advance in training. Other authors have questioned the very notion of "preparedness" for medical trainees, for whom performance depends heavily on the shifting contexts of their work environment.[37] Our study provides a different perspective, namely that trainees can exert agency in how they use goal setting, strategic actions, and ongoing reflection to prepare themselves for the needs they anticipate in unsupervised practice, even if the specifics of their future practice remain unpredictable.

Our participants' learning strategies align with recent work that has described SRL as context dependent.[12,15] Senior trainees are more likely to employ nuanced learning strategies because they have developed competence with routine aspects of care over time within the contexts of their training environments.[5] Furthermore, because they were familiar with their learning environments and supervisors, and perhaps because they felt a sense of urgency from the upcoming transition to practice, our participants seemed empowered to prioritize learning over service to the department. While many participants did reference a tension between "moving the meat" and taking time to grapple with new learning,[38] senior residents in this study seemed more comfortable deferring non-emergent patient care to focus on high-yield learning opportunities. Our results also resonate with other models of self-regulated learning that have been studied in medical training, such as the master adaptive learner framework.[39,40]

Regan et al noted that master adaptive learners identify knowledge and skill gaps based on a combination of performance- and community-related cues; they triage learning opportunities based on complex considerations of needs, desires, and obligations; and they self-assess the effectiveness of their learning efforts.[41] These authors also note the influence of context on SRL, with transitions in training

prompting trainees to re-evaluate and adapt their learning strategies, and the specifics of each learning environment helping to shape the goals that trainees set for themselves.[42] Our study's participants showed similar processes of gap identification, learning, and self-assessment, all heavily influenced by the context of preparing for unsupervised practice during the final months of residency training. It would be informative to study how trainees develop specific learning goals regarding other significant transitions or milestones in training.

While these senior residents' learning strategies were geared toward proactively seeking educational opportunities and fostering autonomy, supervisors clearly played a fundamental role in these experiences. Participants drew from supervisors' support in both explicit and tacit ways—borrowing from supervisors' experience to stretch their learning through hypotheticals that they might see in practice or engaging in new tasks equipped with their metaphorical parachutes. This framing expands the traditional framing of learner-centric SRL cycles toward paradigms such as "co-regulated learning" that emphasize the critical aspects of supervisory support at each step.[43] Supervising physicians can guide senior residents' goals for their workplace learning by highlighting differences between their training environments and their future practice settings, or spotlighting the skills that will maximize their confidence and future success. Supervisors can also guide senior residents to authentic experiences of autonomy and productive struggle,[44] allowing them to grapple with clinical uncertainty while still being available for support.[45]

These findings present several important considerations for residency training programs. First, programs can more meaningfully consider residents' individualized post-training needs, probing for perceived gaps and letting residents select (or even design) experiences that are likely to set them up for success in their unique practice contexts. Second, they can provide level-appropriate supervisory opportunities for senior residents while still in training, whether junior-attending shifts in the ED[46] or moonlighting opportunities that allow them to assume the duties of an attending physician.[47] Experiences when trainees are pushed to "make the call" clearly build confidence for future autonomy.

Finally, while residents in this study identified individualized learning goals, their means for reflection often involved less specific tools such as exam scores and procedure logs. This suggests opportunities for programs to better support each resident's self-regulated learning efforts by helping them identify sources of feedback that meaningfully address their unique and contextualized learning goals. Our results suggest that residents gauge their own performance through multiple sources of feedback that are both explicit (eg, post-shift discussions with attendings, workplace-based assessments, and semi-annual reviews), and implicit (eg, social cues generated from their interactions with attendings, staff, and patients).[48]

LIMITATIONS

Our results and analyses reflect several methodological decisions. We interviewed residents from two residency programs to allow for more diverse perspectives; however, both programs featured large Level I trauma centers and academic hospitals, and most of these residents were preparing for transitions to community practice. Thus, these participants' actual and perceived knowledge gaps and learning goals may not reflect those of trainees from other programs. We focused only on residents' strategies in anticipation of unsupervised practice; thus, our study was not designed to follow-up with participants after graduation to see whether these strategies were actually helpful in fostering preparedness.

It is important to note that this was a preplanned return to a dataset that was initially collected as part of a broader study about residents' preparedness for practice.[3] Returning to these data with a SRL lens enabled us to focus on specific dimensions of participants' stories that were germane to cycles of learning, although this choice may have necessarily excluded other important aspects of their experiences.[49] Finally, MG had professional relationships with the participants that he interviewed, either as a supervisor or former co-resident, and this may have shaped their responses as well as his interpretation of the data.

CONCLUSION

Emergency medicine residents strategically leverage learning strategies in their final months of training to bridge perceived gaps between their self-assessed capabilities and those they anticipate needing to succeed in unsupervised practice. We present these strategies—cherry-picking, case-based hypotheticals, parachuting, and making the call—within cyclical processes of self-regulated learning, although they are notably codependent on supervisory support. These findings suggest tailored approaches whereby programs can support learning experiences that foster senior residents' agency when preparing for the challenges of future practice.

Address for Correspondence: Max Griffith, MD, University of Washington, Department of Emergency Medicine, Harborview Medical Center, Box 359702, 325 Ninth Avenue, Seattle, WA 98104-2499. Email: maxgrif@uw.edu.

Conflicts of Interest: By the WestJEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Griffith et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Hamstra SJ, Yamazaki K. A validity framework for effective analysis and interpretation of milestones data. *J Grad Med Educ*. 2021;13(2s):75-80.
2. Frank JR, Snell L, Sherbino J. CanMEDS 2015 Physician Competency Framework. 2015. Available at: https://www.royalcollege.ca/content/dam/document/standards-and-accreditation/2015-canmeds-framework-reduced-e.pdf. Accessed July 11, 2025.
3. Griffith M, Garrett A, Watsjold BK, et al. Ready, or not? A qualitative study of emergency medicine senior residents' perspectives on preparing for practice. *AEM Educ Train*. 2025;9(1):e70005.
4. Gamborg ML, Mylopoulos M, Mehlsen M, et al. Exploring adaptive expertise in residency: the (missed) opportunity of uncertainty. *Adv Health Sci Educ Theory Pract*. 2024;29(2):389-424.
5. Teunissen PW, Watling CJ, Schrewe B, et al. Contextual competence: how residents develop competent performance in new settings. *Med Educ*. 2021;55(9):1100-9.
6. Cooney RR, Murano T, Ring H, et al. The Emergency Medicine Milestones 2.0: setting the stage for 2025 and beyond. *AEM Educ Train*. 2021;5(3).
7. Holmboe ES, Yamazaki K, Nasca TJ, et al. Using longitudinal milestones data and learning analytics to facilitate the professional development of residents: early lessons from three specialties. *Acad Med*. 2020;95(1):97-103.
8. Eva KW, Regehr G. "I'll never play professional football" and other fallacies of self-assessment. *J Contin Educ Health Prof*. 2008;28(1):14-9.
9. Jain V, Oweis E, Woods CJ. Mapping the distance: from competence to capability. *ATS Sch*. 2023;4(4):400-4.
10. Stephenson J, Weil SW. *Quality in Learning: A Capability Approach in Higher Education*. London, UK: Kogan Page Ltd; 1992.
11. Mylopoulos M, Brydges R, Woods NN, et al. Preparation for future learning: a missing competency in health professions education? *Med Educ*. 2016;50(1):115-23.
12. van Houten-Schat MA, Berkhout JJ, van Dijk N, et al. Self-regulated learning in the clinical context: a systematic review. *Med Educ*. 2018;52(10):1008-15.
13. Zimmerman BJ. Becoming a self-regulated learner: Which are the key subprocesses? *Contemp Educ Psychol*. 1986;11(4):307-13.
14. White CB, Gruppen LD, Fantone JC. Self-regulated learning in medical education. In: Swanwick T (Eds.), *Understanding Medical Education* (201-211). Hoboken, NJ: John Wiley & Sons, 2013.
15. Brydges R, Butler D. A reflective analysis of medical education research on self-regulation in learning and practice. *Med Educ*. 2012;46(1):71-9.
16. Berkhout JJ, Helmich E, Teunissen PW, et al. Exploring the factors influencing clinical students' self-regulated learning. *Med Educ*. 2015;49(6):589-600.
17. Roten C, Baumgartner C, Mosimann S, et al. Challenges in the transition from resident to attending physician in general internal medicine: a multicenter qualitative study. *BMC Med Educ*. 2022;22(1):336.
18. Collini A, Alstead E, Knight A, et al. "You may think that the consultants are great, and they know everything, but they don't": exploring how new emergency medicine consultants experience uncertainty. *Emerg Med J*. 2023;40(9):624-9.
19. Watsjold BK, Griffith M, Ilgen JS. Stuck in the middle: the liminal experiences of entering practice. *Emerg Med J*. 2023;40(9):622-3.
20. Parikh AB. On the Transition to attendinghood. *J Cancer Educ*. 2021;36(1):207-9.
21. Schrewe B. Thrown into the world of independent practice: from unexpected uncertainty to new identities. *Adv Health Sci Educ Theory Pract*. 2018;23(5):1051-64
22. Varpio L, Aschenbrener C, Bates J. Tackling wicked problems: how theories of agency can provide new insights. *Med Educ*. 2017;51(4):353-65.
23. Charmaz K. An invitation to Grounded Theory. In: Charmaz, K. *Constructing Grounded Theory, 2nd Ed.* 1-21. Thousand. Oaks, CA: Sage. Publications, 2014.
24. Albert M, Mylopoulos M, Laberge S. Examining grounded theory through the lens of rationalist epistemology. *Adv Health Sci Educ Theory Pract*. 2019;24(4):827-37.
25. Mylopoulos M, Regehr G, Ginsburg S. Exploring residents' perceptions of expertise and expert development. *Acad Med*. 2011;86:S46-9.
26. Lajoie SP, Gube M. Adaptive expertise in medical education: accelerating learning trajectories by fostering self-regulated learning. *Med Teach*. 2018;40(8):809-12.
27. Panadero E. A review of self-regulated learning: six models and four directions for research. *Front Psychol Frontiers Media S.A.* 2017;8(APR).
28. Apramian T, Cristancho S, Watling C, et al. (Re)grounding grounded theory: a close reading of theory in four schools. *Qualitative Research*. 2017;17(4):359-76.
29. Reconstructing theory in Grounded Theory studies. In: Charmaz K, *Constructing Grounded Theory, A Practical Guide Through Qualitative Analysis*. Thousand Oaks, CA: Sage Publications; 2006:158.
30. Malterud K, Siersma VD, Guassora AD. Sample size in qualitative interview studies. *Qual Health Res*. 2016;26(13):1753-60.
31. Westerman M, Teunissen PW, van der Vleuten CPM, et al. Understanding the transition from resident to attending physician: a transdisciplinary, qualitative study. *Acad Med*. 2010;85(12):1914-9.
32. Wiebe N, Hunt A, Taylor T. "Everything new is happening all at once": a qualitative study of early career obstetrician and gynaecologists' preparedness for independent practice. *Can Med Educ J.* 2024;15(3):6-17.
33. Cogbill TH, Shapiro SB. Transition from training to surgical practice. *Surg Clin North Am*. 2016;96(1):25-33.
34. De Leo AN, Drescher N, Bates JE, et al. Challenges in the transition to independent radiation oncology practice and targeted interventions for improvement. *Tech Innov Patient Support Radiat Oncol*.

2022;24:113-7.
35. de Montbrun S, Patel P, Mobilio MH, et al. Am I cut out for this? Transitioning from surgical trainee to attending. *J Surg Educ.* 2018;75(3):606-12.
36. Teunissen PW, Westerman M. Opportunity or threat: the ambiguity of the consequences of transitions in medical education. *Med Educ.* 2011;45(1):51-9.
37. Kilminster S, Zukas M, Quinton N, et al. Preparedness is not enough: Understanding transitions as critically intensive learning periods. *Med Educ*. 2011;45(10):1006-15.
38. Veysman BD. Butchers move the meat; doctors care for patients. *Ann Emerg Med*. 2010;56(5):578-9.
39. Auerbach L, Santen SA, Cutrer WB, et al. The educators' experience: learning environments that support the master adaptive learner. *Med Teach*. 2020;42(11):1270-4.
40. Cutrer WB, Miller B, Pusic MV, et al. Fostering the development of master adaptive learners: a conceptual model to guide skill acquisition in medical education. *Acad Med.* 2017;92(1):70-5.
41. Regan L, Hopson LR, Gisondi MA, et al. Learning to learn: a qualitative study to uncover strategies used by master adaptive learners in the planning of learning. *Med Teach*. 2019;41(11):1252-62.
42. Regan L, Hopson LR, Gisondi MA, et al. Creating a better learning environment: a qualitative study uncovering the experiences of master adaptive learners in residency. *BMC Med Educ*. 2022;22(1):141.
43. Rich JV. Proposing a Model of co-regulated learning for graduate medical education. *Acad Med.* 2017;92(8):1100-4.
44. Mylopoulos M, Steenhof N, Kaushal A, et al. Twelve tips for designing curricula that support the development of adaptive expertise. *Med Teach.* 2018;40(8):850-4.
45. Ilgen JS, de Bruin ABH, Teunissen PW, et al. Supported Independence: the role of supervision to help trainees manage uncertainty. *Acad Med*. 2021;96(11S):S81-6.
46. Dunbar-Yaffe R, Wu PE, Kay T, et al. Understanding the influence of the junior attending role on transition to practice: a qualitative study. *J Grad Med Educ*. 2022;14(1):89-98.
47. Kaji A, Stevens C. Moonlighting and the emergency medicine resident. *Ann Emerg Med.* 2002;40(1):63-6.
48. Yama BA, Hodgins M, Boydell K, et al. A qualitative exploration: questioning multisource feedback in residency education. *BMC Med Educ*. 2018;18(1).
49. Bolander Laksov K, Dornan T, Teunissen PW. Making theory explicit - An analysis of how medical education research(ers) describe how they connect to theory. *BMC Med Educ.* 2017;17(1).

Characteristics and Educational Support Resources Available to Emergency Medicine Core Faculty: A National Survey

Jaime Jordan, MD, MAEd[*†]
Laura R. Hopson, MD, Med[‡]
Fiona Gallahue, MD[§]
James A. Cranford, PhD[‡]
John C. Burkhardt, MD, PhD[‡‖]
Keith E. Kocher, MD, MPH[‡‖]
Drew L. Robinett, MD[†]
Moshe Weizberg, MD[#]
Tiffany Murano, MD[¶]

[*]Oregon Health & Science University, Department of Emergency Medicine, Portland, Oregon
[†]David Geffen School of Medicine at University of California Los Angeles, Department of Emergency Medicine, Los Angeles, California
[‡]University of Michigan Medical School, Department of Emergency Medicine, Ann Arbor, Michigan
[§]University of Washington, Department of Emergency Medicine, Seattle, Washington
[‖]University of Michigan Medical School, Department of Learning Health Sciences, Ann Arbor, Michigan
[#]Maimonides Midwood Community Hospital, Department of Emergency Medicine, Brooklyn, New York
[¶]Columbia University, Department of Emergency Medicine, New York, New York

Section Editor: Benjamin Holden Schnapp, MD, MEd
Submission history: Submitted February 8, 2025; Revision received May 17, 2025; Accepted May 21, 2025
Electronically published September 2, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI 10.5811/westjem.42503

Introduction: Core faculty are key to supporting the educational mission in emergency medicine (EM). Changes in the Accreditation Council for Graduate Medical Education (ACGME) requirements for minimum protected time for core faculty may no longer guarantee adequate support. We sought to assess EM core faculty characteristics, support, and the impact of the 2019 revisions to ACGME regulations. We explored the influence of individual and institutional characteristics on support and the impact of the regulatory changes.

Methods: This was a cross-sectional survey study of a convenience sample of EM core faculty. Participants completed an online survey of multiple-choice and completion items between April–June 2022. We calculated descriptive and comparative statistics to assess associations between individual (e.g., sociodemographics, rank) and institutional (e.g., region, program type) factors on resources and impact of ACGME revisions.

Results: A total of 596 individuals (57% male) from 116 residency programs participated, including 15 (3%) instructors/lecturers, 280 (47%) assistant professors, 182 (31%) associate professors, and 80 (13%) professors. Most (64%) were 36-50 years of age; 246 (41%) had completed a fellowship. Despite the change to the ACGME requirements in 2019, 417 (70%) reported no modification to their clinical work hours, and 420 (71%) reported no modification to their non-clinical responsibilities. There were statistically significant associations between number of residents per class ($P <$ .001), duration of training program ($P <$ .001), and type of institution ($P <$ .001) with the number of administrative personnel. We also observed statistically significant associations between academic rank ($P =$ .02), region ($P =$.01), number of residents per class ($P =$ 0.02), and type of site ($P =$ .01) with change to clinical work hours after changes to ACGME requirements.

Conclusion: A minority of participants reported a change to their clinical and non-clinical expectations after revisions to the ACGME regulations with disproportionate impact across faculty and program type. [West J Emerg Med. 2025;26(5)1162–1169.]

INTRODUCTION

Academic emergency physicians play a unique and valuable role in the US healthcare system. Although academic emergency departments (ED) make up ~2% of all US EDs, these centers provide care for 5-12% of all acute care patients (> 10 million annually), staffing ~20% of all trauma centers and ~25% of transplant centers.[1,2] However, in addition to their complex patient care responsibilities, the core faculty of these academic centers are charged with multiple extra-clinical responsibilities: training residents and medical students; publishing scholarly work; and filling administrative and quality improvement positions both within and outside the hospital.[3]

Success in these multifaceted roles requires substantial investment in personnel, funds, education, and opportunity.[4] But, as of 2019, such support may not be guaranteed. The Accreditation Council for Graduate Medical Education (ACGME) changed prior regulations on protected time for CF from a limit on clinical hours to a minimum percentage of support, potentially reducing the administrative and financial support they receive for extra clinical responsibilities of their job.[5,6] This recent change has renewed a century-old discussion on the intrinsic value of academic faculty and how best to support and compensate their work.[7,8] Researchers have investigated the characteristics of this complex issue related to academic faculty roles and support, but often from a top-down perspective in which they summatively assess departments through the responses of program directors or department chairs.[1,9,10]

To more deeply understand the core-faculty workforce and the resources they are provided to accomplish their critical responsibilities, the field would benefit from data reported directly by the core faculty themselves. In this study, we aimed to characterize this workforce including sociodemographics, roles, responsibilities, administrative support, protected time, and impact of ACGME regulations. We also sought to test the association of these sociodemographic and institutional characteristics on administrative time and funding resources. Understanding these relationships is crucial to informing regulatory bodies and institutional leadership to provide necessary resources and staffing systems that allow faculty to meet the demands of their job tasks and thrive in their uniquely multidimensional roles.

Population Health Research Capsule

What do we already know about this issue?
Core faculty are essential to the educational mission in EM but may not get adequate support to carry out their tasks.

What was the research question?
What support do core faculty receive, and how have they been impacted by changes in regulatory requirements re protected time?

What was the major finding of the study?
Approximately 70% of participants reported no change to their clinical work hours or non-clinical responsibilities after regulatory revisions.

How does this improve population health?
Insights from core faculty themselves on the impact of fewer protected hours illuminate potential downstream impact on teaching, publishing, and fulfilling administrative duties.

METHODS

Design, Setting and Participants

This is a cross-sectional electronic survey study of a convenience sample of core faculty in emergency medicine (EM). We included individuals who were reported as core faculty to the ACGME. We announced the study and directly recruited participants at the Council of Residency Directors in Emergency Medicine (CORD) 2021 Academic Assembly and through emails on the organizational listserv. We also directly reached out to programs to seek diverse representation with regard to region, duration of training, and institution type. We collected data between April–June 2022.

Study Protocol

We emailed participants a link to an online survey. Informed consent was implied by those who clicked the survey link. We sent up to three reminders to non-responders at regular intervals. We provided participants with a $10 gift card for survey completion. To maximize response rates and minimize guessing, we did not require participants to answer all items on the survey.

Instrument Development

Our study team of expert educators and education researchers developed the survey after literature review to optimize content validity. We developed the surveys according to best practices in survey design.[11] The survey consisted of multiple-choice and completion items. We read all items aloud among the author group and piloted the survey with a small group of EM faculty to ensure response process validity. We made revisions for clarity and readability based on feedback. The final survey is available in Appendix A.

Data Analysis

As this was an exploratory study, we did not conduct

statistical power analyses or sample size estimates. We calculated descriptive statistics including percentages and measures of central tendency to detail respondent demographics and responses to survey items with discrete answer choices. We used chi-squared tests, independent-groups *t*-tests, and correlational analyses to examine associations between individual and institutional characteristics with outcome variables of number of administrative personnel, job responsibilities, clinical work hours, and non-clinical expectations. An alpha level of .05 was used for all analyses, and all statistical significance tests were two-tailed. We conducted all analyses with the SPSS software package v29.0 (IBM Corp, Armonk NY).

Institutional Review Board Statement

This study was reviewed by the Institutional Review Board of the University of Michigan and determined to be "exempt" based on federal exemption category 3(i)(B) at 45 CFR 46.104(d).

RESULTS

A total of 596 core faculty from 116 EM residency programs participated in this study. We report the characteristics of participants, programs, and institutions in Table 1. Participants were most motivated to be core faculty by the additional opportunities to mentor and teach trainees, to participate in the educational program, and obtain recognition of their educational work with 475 (80.0%), 429 (72.0%), and 261(44.0%) identifying these as one of their top three most important motivators, respectively. While participants received multiple benefits from being core faculty, they had additional responsibilities (Table 2). They found scholarship requirements, completion of assessments, and involvement in the didactic curriculum to be their most challenging responsibilities, with 336 (68.7%), 298 (60.9%), and 238 (48.7%) ranking these as their top three most difficult responsibilities, respectively.After the change to the ACGME requirements in 2020, 417 core faculty (70%) reported no change to their clinical work hours and 420 (70.5%) reported no change to their non-clinical responsibilities (Table 2). Of the 52 participants (11.1%) who reported that the change in ACGME requirements affected their clinical work hours, a greater percentage of assistant (11.3%) and associate professors (11.5%) were affected compared to professors (4.0 %) and instructors/lecturers (0%), $P = .01$. The average number of residents per class was statistically significantly lower among those who indicated that the change in ACGME requirements of July 2020 affected their clinical work hours (mean 11.1 ± 3.3) vs those who indicated that it did not (mean 12.1 ± 3.5), $P = .02$. Type of site was statistically significantly associated with change to clinical work hours after changes to ACGME requirements (P = .01) with 66.7% of military/ Veterans Administration (VA) sites, 14.8% of community sites, 9.2% of county/public sites, 8.8% of university sites, and

Table 1. Participant, program, and institution characteristics in a survey of emergency medicine core faculty.

	Total N = 596 n (%)
Sex	
Male	338 (57)
Female	243 (41)
Unknown/Missing	15 (3)
Race	
Asian, Native Hawaiian or other Pacific	57 (10)
Islander	12 (2)
Black	36 (6)
Hispanic	436 (73)
White, Non-Hispanic	34 (6)
Other	21 (4)
Prefer not to say/Missing	
Age	
< 35	92 (15)
36-50	383 (64)
51-65	95 (16)
> 65	12 (2)
Unknown/Missing	14 (2)
Years in practice in emergency medicine	
0-5	119 (20)
6-10	192 (32)
11-15	116 (20)
16-20	59 (10)
21-25	49 (8)
> 26	50 (8)
Unknown/Missing	11 (2)
Years in educational role	
0-5	244 (41)
6-10	169 (28)
11-15	64 (11)
16-20	53 (9)
21-25	24 (4)
> 26	27 (5)
Unknown/Missing	15 (3)
Fellowship training	
No	337 (57)
Yes	246 (41)
Missing	13 (2)
Fellowship completed*	
Administration	7 (3)
Critical care	12 (5)
Education/Medical education	44 (18)
EMS	21 (9)
Hyperbaric medicine/Dive medicine	1 (0)
Pediatrics	26 (11)
Research	17 (7)
Toxicology	27 (11)
Ultrasound	60 (24)
Other	38 (15)
Missing	5 (2)
Advanced degrees	
MD	502 (86)
DO	68 (12)
MA	26 (4)

MD, Doctor of Medicine; DO, Doctor of Osteopathic Medicine; MA, Master of Arts

Table 1. Continued

	Total N = 596 n (%)
MHPE	14 (2)
PhD	10 (2)
Other	121 (21)
MBA	0 (0)
EdD	0 (0)
JD	0 (0)
PharmD	0 (0)
Missing	13 (2)
Academic rank	
Instructor/Lecturer	15 (3)
Assistant Professor	280 (47)
Associate Professor	182 (31)
Professor	80 (13)
Other	26 (4)
Unknown/Missing	13 (2)
Administrative roles**	
Program Director	68 (13)
Assistant/Associate Program Director	127 (25)
Clerkship Director	51 (10)
Assistant or Associate Clerkship Director	21 (4)
Fellowship Director	64 (12)
Medical Director or Assistant/Associate Medical Director	67 (13)
EMS Director or Assistant/Associate EMS Director	40 (8)
Ultrasound Director or Assistant/Associate Ultrasound Director	49 (10)
Research Director or Assistant/Associate Research Director	24 (5)
Vice Chair	46 (10)
Chair	23 (4)
Designated Institutional Official	3 (1)
Assistant/Associate Dean	17 (3)
Other	131 (25)
Missing	79 (13)
Institution has specific faculty promotion tracks	
No	201 (34)
Yes	384 (65)
Unknown/Missing	11 (2)
Specific faculty promotion track	
Clinical Administrator	21 (4)
Clinical Educator	275 (46)
Instructional	9 (1)
Research	27 (5)
Other	50 (8)
Unknown/missing	214 (35)
Promotion track with tenure	
No	427 (72)
Yes	81 (14)
Unknown/missing	88 (15)
Region	
Midwest	131 (22)
Northeast	140 (24)
South	172 (29)
West	153 (26)
Program format	
PGY 1-3	414 (70)
PGY 1-4	166 (28)
Type of primary training site	
Community	195 (33)
County/Public	103 (17)
Military/VA	3 (0.5)
University	243 (41)
Other	34 (6)
Faculty employment model of primary training site	
School of Medicine Employee	234 (40)
Direct Hospital Employee	166 (28)
Large Contract group (Covers > 10 EDs)	93 (16)
Small Contract group (Covers ≤ 10 EDs)	16 (3)
Democratic group	24 (4)
Independent Contractor	9 (2)
Other	39 (7)
Unknown/missing	15 (3)
Number of residents per class (mean ± standard deviation)	12 ± 3.5
Number of personnel in program administration (mean ± standard deviation)	3.6 ± 4

MHPE, Master of Health Professions Education; *PhD,* Doctor of Philosophy; *MBA,* Master of Business Administration; *EdD,* Doctor of Education; *JD,* Juris Doctor; *PharmD,* Doctor of Pharmacy; *EMS,* emergency medical services.

*Based on *n* = 246 who responded "Yes" to "Have you completed a fellowship training program?"
**Participants could select more than one role.
PGY, postgraduate year; *VA*, Veterans Administration; *ED*, emergency department.

7.1% of other sites reporting a change to clinical hours. Region was also statistically significantly associated with change to clinical work hours after changes to ACGME requirements ($P = .09$) with 18.0% of programs in the South, 11.7% of programs in the Midwest, 7.5% of programs in the Northeast, and 5.8% of programs in the West reporting a change to clinical hours.Of the 596 study participants, 400 (71.8%) reported that the previous ACGME requirements accurately reflected their commitments and responsibilities. Academic rank was statistically significantly associated with accurate reflection of responsibilities in previous ACGME requirements ($P = .18$) with 84.4% of professors, 85.4% of associate professors, 76.3% of assistant professors, and 62.5% of instructors/lecturers reporting that that the prior ACGME requirements accurately reflected their commitments and responsibilities. The average number of residents per class was statistically significantly higher among those who indicated that the previous ACGME requirements accurately reflected their commitments and responsibilities (mean 12.1 ± 3.4) vs those who indicated that the previous ACGME

Table 2. Reported benefits and responsibilities of being core faculty in emergency medicine,

	M (SD) or n (%) Total N = 596
Responsibilities and benefits received as core faculty*	
Additional clinical time with trainees	223 (41%)
Additional didactics	294 (54%)
Additional administrative responsibilities	399 (73%)
Protected time	372 (68%)
Faculty development opportunities	309 (57%)
Additional compensation	137 (25%)
Other	26 (5)
Missing	49 (8%)
Mean percentage of FTE reduction for being core faculty**	32.0 (21.7)
Mean additional CME funds (in dollars per year) for being core faculty***	2,078.2 (3,778.9)
Did the previous ACGME requirements accurately reflect your commitments and responsibilities?	
No	102 (17.1%)
Yes	400 (67.1%)
Unknown/Missing	94 (15.8%)
Did the change to the ACGME requirements in July 2019 affect your clinical work hours?	
No	417 (70.0%)
Yes	52 (8.7%)
Unknown/Missing	127 (21.3%)
Did the change to the ACGME requirements in July 2019 affect your non-clinical expectations?	
No	420 (70.5%)
Yes	43 (7.2%)
Unknown/Missing	133 (22.3%)
If your group decreases their current level of support for core faculty in terms of shift numbers or non-clinical expectations, how would it change your willingness to serve as core faculty?	
Significantly decrease	203 (34.1%)
Slightly decrease	162 (27.2%)
No change	177 (29.7%)
Slightly increase	9 (1.5%)
Significantly increase	5 (0.8%)
Missing	40 (6.7%)
In the past two years, which of the following scholarship requirements for core faculty status have you met?*	
Peer-reviewed publications	410 (75%)
Non-peer-reviewed publications	291 (54%)
Textbooks/chapters	219 (40%)
Presentations at Local/ Regional/National organizations	454 (84%)
Committee leadership	397 (73%)
Editorial services	223 (41%)
Grants	130 (24%)
Missing	52 (9%)

*Participants could select more than one response.
*Based on responses from n = 53 participants.
**Based on responses from n = 232 participants.
FTE, full-time equivalent; *CME,* continuing medical education; *ACGME,* Accreditation Council for Graduate Medical Education.

requirements did not accurately reflect their commitments and responsibilities (mean 11.2 ± 3.5), $P = .02$. There were no statistically significant differences between sex, race, academic rank, type of institution, region, residency duration, or number of residents per class on changes to non-clinical expectations after revisions to the ACGME requirements.

There were statistically significant differences by program duration (three vs four years) and number of residents and number of personnel in program administration. The average number of personnel working in program administration was higher among participants from four-year programs (mean 5.0 [SD = 6.2]) compared to participants from three-year programs (3.1 [SD = 2.6]), $P < .001$. Programs with more residents also had more personnel in program administration ($r(575) = .18$, $P < .001$). The mean number of administrative personnel was also higher in county/public (4.5 [SD = 5.7]) and university (4.4 [SD = 4.3]) than community (2.4 SD = 2.0), military/VA (2.0 [SD = 0.0]) and other (2.8 [SD = 1.8]) training sites ($P < .001$) and higher in the West (4.6 [SD = 5.8]) and Midwest (4.0 [SD = 4.5]) than the South (3.3 [SD = 2.1]) and Northeast (2.7 [SD = 2.3]) regions ($P < .001$).

DISCUSSION

The previous EM program requirements had a 28 hours/week ceiling on the amount of clinical time that core faculty were permitted to work.[5] When considering a 40-hour work week, this allotted core faculty 12 hours per week for administration and educational activities. The 2023 requirements establish a floor of 0.1 full-time equivalent (FTE) of protected time for core faculty, or approximately four hours per week in the 40-hour work week model.[15] Understanding the workforce composition, its responsibilities, and impact of the ACGME changes is critical to determining whether this model of support is adequate. Drawing from a broad cross-section of EM core faculty across geographic regions, program types, and training sites, we are able to describe the core faculty workforce. In comparison to other recent studies of EM, residency core faculty have similar sex distributions to large studies of national specialty organizations.[16]

Our study noted significant associations between academic rank and faculty responsibilities as well as clinical work hours. Most faculty indicated that the prior ACGME requirements accurately reflected their educational commitments, particularly those at the rank of professor and associate professor. These findings may reflect the solidification of responsibilities and alignment with regulatory requirements as faculty progress in their careers. Although at the time of data collection, only a small subset of participants (11%) had been impacted by higher clinical work hours, we found that faculty at the assistant or associate professor rank may be disproportionately affected. These mid-career faculty may have been at the sweet spot to squeeze. They have advanced beyond the very early career stage and may have some administrative time to lose in favor of clinical work compared to clinical instructors who may have already been working substantial clinical time that could not be significantly increased. Yet they are not as advanced in their careers as professors who may have more secure means of protected time such as grant funding or advanced leadership positions.

It is not surprising that programs with larger numbers of residents had more program administrative personnel, highlighting the scaled requirement for resources to the size of the programs.[3,15] This is evident in the ACGME requirements regarding the minimum number of program coordinators, which are scaled to increase with the increased size of a program.[3,15] The higher numbers of additional personnel in program administration among four-year programs is likely a reflection of the relative sizes of four-year programs being overall larger.[17] Similar associations between size and duration of program have been seen with other outcomes.[18]

Interestingly, although there was no change in the clinical expectations for most participants, there were changes in clinical hours associated with faculty from programs with fewer residents with the new program requirements. This may be due to a perception that smaller programs require less time to administer. While this may be true, there is still a significant amount of time required for engaging in other programmatic and education-related activities that take place regardless of the number of residents in a program (eg, attendance at weekly conference, preparation and delivery of didactic sessions, interview/recruitment efforts, medical student mentoring, scholarship efforts). The correlation between programs with fewer residents and faculty who experienced changes in their clinical work hours as well as their commitments and responsibilities suggests that the smaller programs may have less flexibility in redistributing the clinical and administrative workloads when the ACGME requirements were modified. This potentially places a higher burden on these faculty, expecting them to perform more administrative duties with less time to do so. We also detected associations between type of site and region on changes to clinical hours. This may reflect variations in employment models, funding streams, and institutional priorities.[19]

One of the problems with establishing the floor on protected time, rather than capping the clinical time, is that there is wide variability among institutions (and EDs) as to what is considered 1.0 FTE. Although hour ranges are not explicitly detailed in the literature, institutional definitions of an FTE have been noted to vary from 40 to ≈ 60 hours/week based on individual operational needs and expectations. Emergency departments also vary in what is considered a clinical FTE, 32 vs 36 hours/week.[22-24] With this lack of standardization, the change in the protected time requirement left room for interpretation by organizational, institutional, and departmental leadership to mean that the minimum requirement is the only amount of time necessary for core faculty activities.

LIMITATIONS

This survey-based study was subject to sampling and response bias with those most engaged in educational programming or most impacted by the ACGME changes potentially being more likely to respond. Future surveys of EM core faculty could be strengthened by systematic assessment of potential non-response bias. While our participants only represent a fraction of the total number of core faculty in EM, they do appear to parallel specialty educator demographics.[25-28] Our data cover a broad cross-section of program characteristics; however, the sample may not be completely representative of the whole.

CONCLUSION

This study highlights potential concerns about the impact of the changed ACGME requirements for core faculty support on the educational environment for EM residency training. Additional work will be needed to track temporal trends, the potential for disproportionate impact among faculty members and programs, the effect on the learning environment, and the quality of residency training.

Address for Correspondence: Jaime Jordan, MD, MAEd, David Geffen School of Medicine at UCLA, Department of Emergency Medicine, 1100 Glendon Avenue, Suite 1200, Los Angeles, CA 90024. Email: jaimejordanmd@gmail.com

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Jordan et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Reznek MA, Scheulen JJ, Harbertson CA, et al. Contributions of academic emergency medicine programs to U.S. health care: summary of the AAAEM-AACEM benchmarking data. *Acad Emerg Med*. 2018;25(4):444-52.
2. Reznek MA, Michael SS, Harbertson CA, et al. Clinical operations of academic versus non-academic emergency departments: a descriptive comparison of two large emergency department operations surveys. *BMC Emerg Med*. 2019;19(1):72.
3. Accreditation Council for Graduate Medical Education. Common Program Requirements (Residency). 2023. Available at: https://www.acgme.org/globalassets/pfassets/programrequirements/cprresidency_2023.pdf. Accessed February 7, 2025.
4. Yarris LM, Juve AM, Artino AR Jr, et al. Expertise, time, money, mentoring, and reward: systemic barriers that limit education researcher productivity-proceedings from the AAMC GEA Workshop. *J Grad Med Educ*. 2014;6(3):430-6.
5. Greenberger SM, Finnell JT 2nd, Chang BP, et al. Changes to the ACGME Common Program Requirements and their potential impact on emergency medicine core faculty protected time. *AEM Educ Train*. 2020;4(3):244-53.
6. Yuan CM, Young BY, Watson MA, et al. Programmed to fail: the decline of protected time for training program administration. *J Grad Med Educ*. 2023;15(5):532-5.
7. Duffy TP. The Flexner Report--100 years later. *Yale J Biol Med*. 2011;84(3):269-76.
8. Gunderman RB. The perils of paying academic physicians according to the clinical revenue they generate. *Med Sci Monit*. 2004;10(2):RA15-20.
9. Jarrett JB, Griesbach S, Theobald M, et al. Nonclinical time for family medicine residency faculty: national survey results. *PRiMER*. 2021;5:45.
10. Accreditation Council for Graduate Medical Education. *Data Resource Book*. 2022-2023. Available at: https://www.acgme.org/about/publications-and-resources/graduate-medical-education-data-resource-book/. Accessed February 7, 2025.
11. Rickards G, Magee C, Artino AR. You can't fix by analysis what you've spoiled by design: developing survey instruments and collecting validity evidence. *J Grad Med Educ*. 2012;4(4):407–10.
12. Lincoln YS, Lynham SA, Guba EG. Paradigmatic controversies, contradictions, and emerging confluences, revisited. *Sage Handbook Qualitat Res*. 2011;4:97-128.
13. Terry G, Hayfield N, Clarke V, et al. Thematic analysis. In: *The SAGE Handbook of Qualitative Research in Psychology.* Thousand Oaks, CA: SAGE Publications Ltd.; 2017:17-37.
14. Bradley EH, Curry LA, Devers KJ. Qualitative data analysis for health services research: developing taxonomy, themes, and theory. *Health Serv Res*. 2007;42:1758-1772.
15. Accreditation Council for Graduate Medical Education. ACGME Program Requirements for Graduate Medical Education in Emergency Medicine. 2023. Available at: https://www.acgme.org/globalassets/pfassets/programrequirements/110_emergencymedicine_2023.pdf. Accessed February 7, 2025.
16. Bennett CL, Ling AY, Agrawal P, et al. How we compare: Society for Academic Emergency Medicine faculty membership demographics. *AEM Educ Train*. 2022;6(Suppl 1):S93-6.
17. Gaeta TJ, Ankel FK, Calderon Y, et al. American Board of Emergency Medicine Report on Residency and Fellowship Training Information (2023-2024). *Ann Emerg Med*. 2024;84(1):65-81.
18. Jordan J, Hwang M, Kaji AH, et al. Scholarly Tracks in emergency medicine residency programs are associated with increased choice of academic career. *West J Emerg Med*. 2018;19(3):593-9.
19. Adelman L. 2023 State of the emergency medicine employer market. 2023. Available at: https://assets.ivyclinicians.io/content/2023%20State%20of%20the%20EM%20Employer%20Market_Ivy%20Clinicians.pdf. Accessed February 7, 2025.
20. Li K, Al-Amin M, Rosko MD. Early financial impact of the COVID-19

pandemic on U.S. hospitals. *J Healthc Manag*. 2023;68(4):268-283.
21. Gottlieb M, Sebok-Syer SS, Bawden A, et al "Faces on a screen": a qualitative study of the virtual and in-person conference experience. *AEM Educ Train*. 2022;6(6):e10827.
22. Moorhead JC, Gallery ME, Hirshkorn C, et al. A study of the workforce in emergency medicine: 1999. *Ann Emerg Med*. 2002;40(1):3-15.
23. Nurok M, Flynn BC, Pineton de Chambrun M, et al. A review and discussion of full-time equivalency and appropriate compensation models for an adult intensivist in the United States across various base specialties. *Crit Care Explor*. 2024;6(4):e1064.
24. Medscape. Your income vs your peers': medscape emergency medicine physician compensation report 2023. Available at: https://www.medscape.com/slideshow/2023-compensation-emergency-medicine-6016356?icd=login_success_gg_match_norm. Accessed February7, 2025.
25. Jordan J, Coates WC, Clarke S, et al. Exploring scholarship and the emergency medicine educator: a workforce study. *West J Emerg Med*. 2017; 18(1):63-8.
26. Golden A, Diller D, Riddell J, et al. A workforce study of emergency medicine medical education fellowship directors: describing roles, responsibilities, support, and priorities. *AEM Educ Train*. 2022; 6(5):e10799.
27. Coates WC, Gill AM, Jordan R. Emergency medicine clerkship directors: defining the characteristics of the workforce. *Ann Emerg Med*. 2005; 45(3):262-8.
28. Beeson MS, Gerson LW, Weigand JV, et al. Characteristics of emergency medicine program directors. *Acad Emerg Med*. 2006; 13(2):166-72.

Substantial Variation Exists in Clinical Exposure to Chief Complaints Among Residents Within an Emergency Medicine Training Program

Corlin M. Jewell, MD*
Amy T. Hummel, MD*†
Dann J. Hekman, MS*
Benjamin H. Schnapp, MD, MEd*

*University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, Madison, Wisconsin
†Emergency Medicine Specialists SC, Wauwatosa, Wisconsin

Section Editors: Doug Franzen, MD and Andrew Ketterer, MD
Submission history: Submitted February 25, 2024; Revision received September 27, 2024; Accepted October 11, 2024
Electronically published November 19, 2024
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.20281

Introduction: While many aspects of emergency medicine (EM) residency training are standardized among residents within a single residency program, there is no standard for the distribution of chief complaints (CC) that residents should see over the course of residency. This could result in substantial variability in each resident's clinical exposure. Our objective in this study was to explore EM residents' clinical exposure to CCs to determine whether substantial variation exists. If such variation exists, this could suggest the need for curricular reform to address gaps in resident clinical exposure during training.

Methods: This was a retrospective observational study of EM residents who graduated in the years 2016–2021 at a single, university-affiliated emergency department (ED) in the midwestern United States. All patient encounters where a CC was logged were included and categorized into 1 of 20 clinical domains based on the 2016 American Board of Emergency Medicine Model of Clinical Practice. We calculated descriptive statistics for the top 10 most encountered domains for comparison among residents.

Results: We included a total of 228,916 patient encounters from 69 residents in the analysis. Residents were involved in an average of 3,323 distinct patient encounters during the study period. The overall interquartile range for patient encounters was 523. The three CC domains with the broadest interquartile variation were abdominal and gastrointestinal disorders (116), musculoskeletal disorders (nontraumatic) (93), and traumatic disorders (86).

Conclusion: Within a single, three-year academic EM program, substantial variation existed among residents with regard to the variety of patient CCs seen during their residency training. [West J Emerg Med. 2025;26(1)47–52.]

INTRODUCTION

Medical residency training allows physicians to gain the cognitive and procedural skills necessary to practice independently. Based on experiential learning theory, patient encounters form the foundation upon which physicians in training begin to master the practice of medicine.[1] Additionally, the development of "illness scripts," or mental models for the classification of patient presentations, is crucial to the development of clinical skills and reasoning during residency training.[2] These models are developed over time by multiple exposures to presentations of similar disease states.[3,4] Emergency medicine (EM) trainees must be exposed to a variety of patient chief complaints (CC) throughout the course of residency to develop these scripts and become ready to begin independent practice.

Educators within EM have worked to define many aspects of EM residency training, including optimum number of shifts, on-shift educational goals/practices, and didactic content.[5] Despite this, the clinical experience of an individual resident may be highly variable and may be partially driven by self-selection of patients by the resident. Studies in pediatric EM suggest that there is significant variation in the overall number of patients and range in acuity among individual residents.[6,7] However, there is little adult EM literature that explores the variation in clinical experience seen by residents within a modern EM program. The literature that does exist in adult EM suggests there is substantial variation in clinical exposures among residents.[8] A study from 2006 found that the number of cases seen overall correlated with improved performance on a standardized test designed to assess clinical competence. However, the effect plateaued at around 200 cases.[9] Prior work by our group has shown that case volume in an individual domain did not correspond to performance within that domain on corresponding questions on the in-training exam.[10]

These studies suggest that individuals within a single training program may be gaining variable experience with certain types of patient presentations and lacking exposure (and therefore opportunities to develop mastery) to other complaints and pathology. However, this variability in clinical exposure during training has not been shown in adult EM for over three decades.[8] Since then, the number of annual visits to the ED as well as the complexity of medical care provided have substantially increased.[11,12] We, therefore, hypothesized that substantial differences in clinical exposure still exist among residents at the time of graduation. Understanding these differences is of critical importance for residency programs as considerable variation could push some residents below a threshold to develop robust illness scripts suitable for independent practice.

Population Health Research Capsule

What do we already know about this issue?
Studies from 30 years ago reported variation in the distribution of chief complaints seen by emergency medicine residents during training.

What was the research question?
We hypothesized that substantial differences in clinical exposure still exist among residents at the time of graduation.

What was the major finding of the study?
The three chief complaint domains with the most variability between individual resident experience, as measured by the greatest 25–75 interquartile ranges were abdominal and gastrointestinal disorders (median 594 patients per resident, IQR 116), nontraumatic musculoskeletal disorders (median 314, IQR 92), and traumatic disorders (median 525, IQR 86).

How does this improve population health?
Understanding these differences is important, as substantial variation could mean that some residents do not develop robust illness scripts suitable for independent practice.

METHODS

Study Design and Setting

We conducted this retrospective, observational study at a three-year EM residency program situated within an urban, academic emergency department (ED) in the Midwest. The ED for the primary clinical site has a total of 54 beds and sees an annual volume of approximately 60,000 patient visits. During the study period, the residency had 12 first postgraduate year one (PGY-1) positions available each year. The study ED divides its beds into two adult clinical areas and a pediatric clinical area. All three areas are physically connected on a single floor of the hospital. Residents from all three years are assigned to nine-hour shifts in each clinical area. Each shift includes 1–2 junior (PGY-1) residents, 1–2 senior (PGY-2 or PGY-3) residents, and one attending physician. Any resident can assign themselves to patients of any severity regardless of seniority. In Fall 2020, the study ED shifted from a "pod" model in which the two adult clinical areas would assign themselves predominately to patients in their clinical area to a "free-for-all" model in which either adult team could assign themselves to any adult patient regardless of the clinical area they were roomed in. During the study, physician assistants were employed in the ED and would occasionally take the place of a resident on shift (particularly during weekly resident didactics).

Data Acquisition

Residents were eligible for inclusion if they had completed residency within three consecutive years and graduated in the years 2016–2021 (therefore, the study period was from June 2013–June 2021). The electronic health record (EHR) was used to create a database of patient encounters; all encounters where eligible EM residents were the first resident assigned to the patient were analyzed. We used deidentified patient encounter data, listed by first CC. The CC was used to identify the nature of the patient encounter as this data was available at the time of patient presentation, often dictates the patient's ED workup, and would not have been affected by information discovered during the later stages of a

patient's hospital course. This approach is consistent with prior literature.[9,13] To maintain anonymity, only the senior author, a member of the residency leadership team, had access to each resident's individualized study identification number.

We excluded from analysis encounters where no CC was listed or no resident was assigned. In cases where multiple residents were assigned to a single encounter (e.g., a patient had been signed out to a different resident), we analyzed this encounter only for the initial resident assigned. This was done as they are typically the most involved in the cognitive workload of determining the patient's initial diagnostic and treatment plan. The CC for each encounter was selected and entered into the EHR by the primary nurse who cared for the patient in the ED initially. At our institution, this is nearly always selected from a list of common CCs, although it can be entered as free text. Encounters in which multiple CCs were listed were only coded into a single domain based on the first listed CC.

Data Analysis

A list of common CCs in EM has been categorized into a set of 20 content domains via a consensus process by two EM attendings using the 2016 American Board of Emergency Medicine (ABEM) Model of Clinical Practice as a framework.[14] For CCs identified in our data that were not already categorized by a previously described method,[13] we repeated the same categorization process in which each CC was assigned to a single domain by two board-certified EM attending physicians at our institution. Disagreements between the two reviewers were adjudicated by a third board-certified emergency physician. If a symptom was entered as the CC, such as "fever" (which could correspond to one of multiple domains), it was preferentially categorized into a domain based on what the coding physicians felt was the most likely to dictate the ED workup, rather than the "signs, symptoms, and presentations" domain. We used Excel (Microsoft Corp, Redmond, WA) to calculate descriptive statistics and create plots and tables. The top 10 most encountered domains overall were analyzed. We excluded less common domains given the low number of total encounters in each area, which would have been more vulnerable to random fluctuations in when these patients present to the ED.

This project was deemed exempt quality improvement by the University of Wisconsin Health Sciences Institutional Review Board.

RESULTS

A total of 315,614 encounters were initially identified from the EHR. Of these encounters 198 were excluded as no CC was listed. After excluding residents whose clinical experience was outside the study period and those who had left the training program prior to graduation or had a prolonged leave of absence, a total of 228,916 patient encounters from 69 residents were included in the analysis. Each resident was assigned to an average of 3,323 distinct patient encounters Assessment of the top 10 most common clinical exposure domains showed wide ranges in the case numbers of individual residents. The Table lists the mean, minimum, maximum, interquartile range (IQR) and 25th and 75th percentile for the 10 most common content domains. The Figure shows the range of exposure to the 10 most common domains in box-and-whisker format.

DISCUSSION

Our data suggests that residents within a single training program have substantial variation in their clinical experiences as measured by the variation in ABEM content

Table. Mean, 25th–75th percentile ranges, interquartile range, and minimum/maximum encounters for the 10 most encountered domains per resident.

	Mean	Median	25th, 75th percentile	IQR	Minimum, maximum
Total encounters	3323		3086, 3609	523	2595, 4053
Abdominal and gastrointestinal disorders	583	594	528, 644	116	416, 721
Traumatic disorders	529	525	484, 570	86	370, 725
Cardiovascular disorders	327	330	302, 356	54	233, 429
Nervous system disorders	319	319	301, 340	39	226, 402
Musculoskeletal disorders (non-traumatic)	314	314	269, 361	92	179, 460
Thoracic-respiratory disorders	280	281	246, 313	67	178, 383
Systemic infectious disorders	165	169	149, 179	30	115, 219
Head, ear, eye, nose, and throat disorders	150	151	136, 165	29	96, 196
Signs, symptoms, and presentations	129	130	120, 142	22	88, 170
Psycho-behavioral disorders	126	128	106, 139	34	67, 211

IQR, interquartile range.

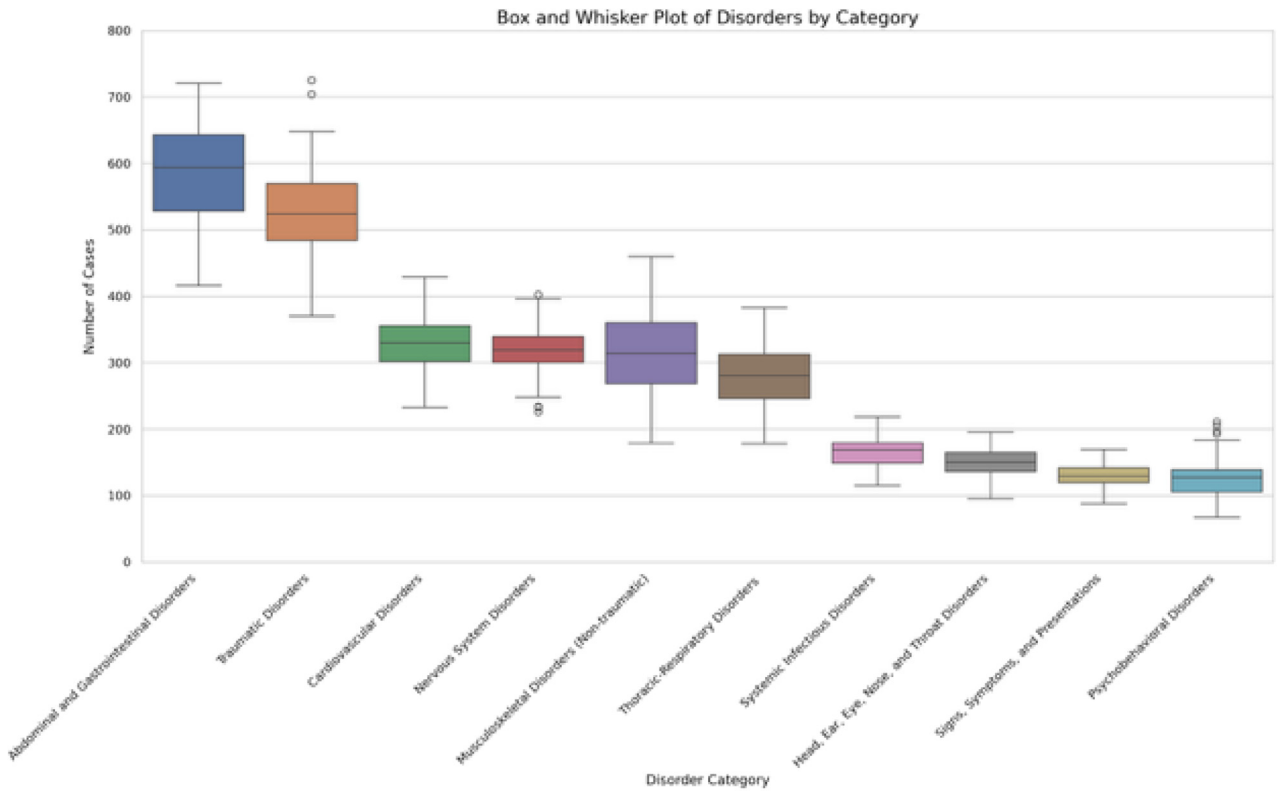


Figure. Top 10 most common clinical exposure domains seen by graduation per resident. Boxes illustrate the 25th–75th percentile of number of clinical exposures by residents in each domain, with whiskers representing the minima, maxima, and outliers.

domains seen by individual residents. This is similar to what was described by Langdorf et al. in 1990, despite the previous study being performed over three decades ago and the substantial subsequent differences in the utilization of the ED.[8] We found wide interquartile ranges between the maximum and minimum number of encounters among residents, suggesting that some residents saw substantially more patients within particular domains than others.

The magnitude of the educational significance of the exposure variability of residents is unclear. It is possible that a resident who sees twice as many musculoskeletal chief complaints as another resident by graduation is significantly more competent in that domain. Alternatively, it is also possible that they have both attained the minimal level of exposure to competently manage musculoskeletal complaints independently. The effects of clinical exposure on clinical competence, including the minimal number of encounters required to demonstrate competency in a particular domain, is an open question and an avenue for further research. However, the formation of illness scripts is continually modified by subsequent patient encounters.[3,4] Therefore, the identification of high degrees of variation among residents may prompt program leadership to institute changes in the curriculum or supplement clinical exposure with individualized learning plans. This is likely more important for domains that are encountered less frequently overall, such as psycho-behavioral disorders, where larger relative differences in exposure could result in greater deficits in illness script formation.

In addition to prompting changes made by the program, identification of high variability in clinical exposure may enhance resident self-assessment. As demonstrated previously, self-assessment when done in isolation, is an imperfect means of driving improvement but can be enhanced greatly when informed by additional information from a variety of sources.[15] Understanding the distribution of the patient encounters residents have during training, and the potential gaps in their clinical exposure, could be a potential means of allowing for informed self-assessment for a resident's clinical skills. This could be potentially further enhanced if facilitated under the supervision of faculty coaches within the program, a method that has become increasingly popular in medical education.[16,17] Future work could follow a cohort of residents who are able to track their own patient volumes more regularly than was possible in the current study and compare themselves to their peers throughout training and evaluate whether any differences in clinical competence are identified. This could also allow programs to determine the perceived value of this information to residents. Finally, residents could use this data to drive their patient selection while working in the ED.

Beyond the potential for shaping resident self-assessments, clinical exposure data may have important implications for residency program leadership as we move toward an era of competency-based medical education (CBME). Two of the pillars of CBME, "teaching tailored to competencies" and "effective programmatic assessment,"[18] lend themselves well to the identification of program clinical weaknesses as well as to the creation of new curricular experiences designed to address areas of limited clinical exposure identified by resident CC data. These experiences could potentially take the form of targeted readings or simulation sessions designed to supplement lower frequency clinical encounters.

LIMITATIONS

This was a single-center study in an urban, academic ED, and findings may not be generalizable to training programs in different environments. Additionally, the data was retrospective, making the educational utility of this information or any potential causes of variation difficult to determine.

Use of a CC to categorize each patient encounter into a clinical domain has an element of subjectivity and may have led to some encounters being miscategorized with respect to the workup done or final diagnosis. Some additional subjectivity may have been introduced by how we classified CCs that could potentially have been categorized into multiple different domains (such as "fever" or "ingestion"). This was done based on what was determined to be most likely to drive the initial workup in the department. For example, although a CC of "chest pain" could represent a cardiac or pulmonary etiology, in almost all cases, a cardiac etiology must be excluded. Therefore, it was felt that this would influence the formation and modification of the resident's illness script most heavily. It is also possible that encounters were mischaracterized due to only using the first CC listed and not considering the others if multiple CCs were listed. Like the prior limitation, it was felt that the first CC was most likely to dictate the initial ED workup. Using discharge or final diagnoses instead was considered for this study, but it was felt that the CC is more likely to drive the initial differential and diagnostic workup for the patient.

Additionally, ABEM domains may be too broad to capture important differences in exposure (e.g., two residents with the same exposure to "respiratory disorders" could have seen large numbers of pneumonia patients or, alternatively, many patients with asthma). Training is inherently variable as the EM environment differs by clinical site, day, shift, or even season. Therefore, there may have been slight differences in when individual residents were in the ED clinically or the number/type of overall ED shifts worked. It is important to note that some of the included residents' training occurred during the COVID-19 pandemic, which may have had an effect on both the variety and number of clinical exposures seen by these residents. Future work could also explore exposure based on sub-domains from the ABEM model to get a more granular look at individual resident clinical experiences rather than relying on the relatively broad domains.

Other clinical variables may also have an effect on a resident's clinical exposure, including the timing of months rotating in the ED. However, the ED did not undergo major changes in the staffing model of physicians (including residents) during this period. Also, while it is likely that more senior residents assign themselves to critically ill patients, this was felt to be unlikely to meaningfully impact our results given that data was obtained at the time of graduation. Therefore, each resident would have acted in a senior role for the same amount of time. Finally, our use of the EHR at the main clinical training site of the residency to generate the data did not capture the clinical experience at two other training sites for the residency that use a different EHR. This may have served to moderate or exacerbate the differences seen among residents. However, clinical experiences at these other sites comprised a total of only four months of the 36-month curriculum, and so it is likely that our overall findings would not have been substantially affected.

CONCLUSION

Within a single, three-year academic emergency medicine program, there was substantial variation among residents regarding the variety of patient chief complaints seen throughout residency when mapped to ABEM's Model of Clinical Practice.

Address for Correspondence: Corlin M. Jewell, MD, University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, 800 University Bay Dr., Madison, WI 53705. Email: cmjewell@medicine.wisc.edu

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Jewell et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Teunissen PW, Scheele F, Scherpbier AJ, et al. How residents learn: qualitative evidence for the pivotal role of clinical activities. *Med Educ.* 2007;41(8):763–70.
2. Bowen JL. Educational strategies to promote clinical diagnostic reasoning. *N Engl J Med.* 2006;355(21):2217–25.

3. Custers EJ, Regehr G, Norman GR. Mental representations of medical diagnostic knowledge: a review. *Acad Med.* 1996;71(10 Suppl):S55–61.
4. Hatala R, Normal GR, Brooks LR. Influence of a single example on subsequent electrocardiom interpretation. *Teaching and Learning in Medicine.* 1999;11(2):110–7.
5. Stahmer S and Kuhn G. Optimizing resident training: results and recommendations of the 2009 Council of Residency Directors Consensus Conference. *Acad Emerg Med.* 2010;17 Suppl 2:S78–86.
6. Li J, Roosevelt G, McCabe K, et al. Pediatric case exposure during emergency medicine residency. *AEM Educ Train.* 2018;2(4):317–27.
7. Chen EH, Cho CS, Shofer FS, et al. Resident exposure to critical patients in a pediatric emergency department. *Pediatr Emerg Care.* 2007;23(11):774–8.
8. Langdorf MI, Strange G, Macneil P. Computerized tracking of emergency medicine resident clinical experience. *Ann Emerg Med.* 1990;19(7):764–73.
9. Kern MW, Jewell CM, Hekman DJ, et al. Number of patient encounters in emergency medicine residency does not correlate with in-training exam domain scores. *West J Emerg Med.* 2022;24(1):114–8.
10. Hayashino Y, Fukuhara S, Matsui K, et al. Quality of care associated with number of cases seen and self-reports of clinical competence for Japanese physicians-in-training in internal medicine. *BMC Med Educ.* 2006;6:33.
11. Strange GR and Chen EH. Use of emergency departments by elder patients: a five-year follow-up study. *Acad Emerg Med.* 1998;5(12):1157–62.
12. Cairns C and Kang K. National Hospital Ambulatory Medical Care Survey: 2021 emergency department summary tables. 2023. Available at: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHAMCS/doc21-ed-508.pdf. Accessed September 21, 2024.
13. Bischof JJ, Emerson G, Mitzman J, et al. Does the emergency medicine in-training examination accurately reflect residents' clinical experiences? *AEM Educ Train.* 2019;3(4):317–22.
14. Counselman FL, Babu K, Edens MA, et al. The 2016 model of the clinical practice of emergency medicine. *J Emerg Med.* 2017;52(6):846–9.
15. Wolff M, Santen SA, Hopson LR, et al. What's the evidence: self-assessment implications for life-long learning in emergency medicine. *J Emerg Med.* 2017;53(1):116–20.
16. Deiorio NM, Moore M, Santen SA, et al. Coaching models, theories, and structures: an overview for teaching faculty in the emergency department and educators in the offices. *AEM Educ Train.* 2022;6(5):e10801.
17. Sargeant J, Lockyer J, Mann K, et al. Facilitated reflective performance feedback: developing an evidence- and theory-based model that builds relationship, explores reactions and content, and coaches for performance change (R2C2). *Acad Med.* 2015;90(12):1698–706.
18. Van Melle E, Frank JR, Holmboe ES, et al. A core components framework for evaluating implementation of competency-based medical education programs. *Acad Med.* 2019;94(7):1002–9.

Harder, Better, Faster, Stronger? Residents Seeing More Patients Per Hour See Lower Complexity

Corlin M. Jewell, MD*
Guangyu (Anthony) Bai, MD†
Dann J. Hekman, MS*
Adam M. Nicholson, MD*
Michael R. Lasarev, MS‡
Roxana Alexandridis, PhD‡
Benjamin H. Schnapp, MD, MEd*

*University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, Madison, Wisconsin
†Indiana University School of Medicine-Northwest, Gary, Indiana
‡University of Wisconsin School of Medicine and Public Health, Department of Biostatistics and Medical Informatics, Madison, Wisconsin

Section Editors: Ed Ullman, MD, Christine Stehman, MD, and Doug Franzen, MD
Submission history: Submitted February 25, 2024; Revision received November 20, 2024; Accepted November 22, 2024
Electronically published January 31, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.20282

Introduction: Patients seen per hour (PPH) is a popular metric for emergency medicine (EM) resident efficiency, although it is likely insufficient for encapsulating overall efficiency. In this study we explored the relationship between higher patient complexity, acuity on shift, and markers of clinical efficiency.

Methods: We performed a retrospective analysis using electronic health record data of the patients seen by EM residents during their final year of training who graduated between 2017–2020 at a single, urban, academic hospital. We compared the number of PPH seen during the third (final) year to patient acuity (Emergency Severity Index), complexity (Current Procedural Terminology codes [CPT]), propensity for admissions, and generated relative value units (RVU).

Results: A total of 46 residents were included in the analysis, representing 178,037 total cases. The number of PPH increased from first to second year of residency and fell slightly during the third year of residency. Overall, for each 50% increase in the odds of treating a patient requiring high-level evaluation and management (CPT code 99215), there was a 7.4% decrease in mean PPH. Each 50% increase in odds of treating a case requiring hospital admission was associated with a 6.7% reduction (95% confidence interval [CI] 0.73–12%; $P = 0.03$) in mean PPH. Each 0.1-point increase in PPH was associated with a 262 (95% CI 157–367; $P < 0.001$) unit increase in average RVUs generated.

Conclusion: Seeing a greater number of patients per hour was associated with a lower volume of complex patients and patients requiring admission among EM residents.
[West J Emerg Med. 2025;26(2)254–260.]

INTRODUCTION

The 2019 American Board of Emergency Medicine Model of Clinical Practice recognizes task- switching and multiple patient care as core physician tasks,[1] and the Accreditation Council for Graduate Medical Education (ACGME) lists multitasking as Emergency Medicine Patient Care Milestone 7.[2] Emergency physicians (EP) must efficiently evaluate and treat a high volume of patients to effectively manage care in the emergency department (ED). Various metrics have been used to evaluate efficiency and quality of care provided in the ED by the ED staff as well as individual EPs (patient length of stay, ED admission rate, etc).[3,4] A metric commonly used by programs to measure efficiency in residents is the number of patients seen per hour (PPH). This metric is enticing because it is based on data that is easily retrievable and widely applicable across clinical sites.[5,6] However, it is currently unclear whether the number of PPH can adequately encapsulate efficiency in physician trainees. It is also

uncertain how residency programs should consider this metric when assessing their trainees, especially if not considered alongside other metrics.

A physician-in-training who sees more PPH could potentially be seen as more capable of independently managing the higher number of patients required for independent practice. This measurement is already commonly used when evaluating EM residents and is also frequently used to evaluate attending EPs.[5,6] However, it is unclear whether there are tradeoffs for residents that come with seeing a higher patient volume. It is likely that medical trainees are only able to handle a finite number of cognitive tasks before their performance is impaired and they are unable to take on additional tasks.

One method to conceptualize the relationship between how patient complexity and acuity impacts other aspects of patient care is through cognitive load theory.[7] In general, when cognitive load is too high, such as increased extraneous load from managing multiple patients or increased intrinsic load from managing very complex patients, overall cognitive performance may be impaired. This could decrease cognitive bandwidth for new patient-care tasks as well as limit germane load to allow for learning and illness-scheme creation.[7] Conversely, simple, straightforward patient presentations may not impose such a significant cognitive load, allowing cognitive resources to be deployed to see a higher volume of patients.[8,9] Prior studies have assessed resident efficiency in the ED in terms number of PPH as training progresses.[10] These studies have demonstrated that senior residents can see higher numbers of patients per hour compared to postgraduate year (PGY)-1 residents, which plateaus in the final year of training.[11]

Compared to advanced practice practitioners (APP) (physician assistants [PA] or nurse practitioners), residents see fewer PPH but generate a higher amount of relative value units (RVU). This suggests residents may see higher acuity patients or document more thoroughly.[10] The RVUs are an objective means of measuring the resources needed to provide medical care as a single metric.[12] Another means of estimating the resources needed to provide care are ED evaluation and management (E/M) Current Procedural Terminology (CPT) codes. These allow coders to use complexity in documentation as a surrogate marker of complexity of care provided. While RVUs and CPT codes are measures assigned following a patient's ED encounter, the Emergency Severity Index (ESI) is a means of estimating the acuity of the patient in terms of priority and resources allocation based on their initial presentation.

It is currently unknown how patient complexity and acuity may impact markers of clinical efficiency for ED residents. Our aim in this study was to better evaluate this relationship using multiple metrics to allow residency leaders to better contextualize greater resident efficiency in the ED.

Population Health Research Capsule

What do we already know about this issue?
Patients seen per hour (PPH) is commonly used by programs to measure efficiency in residents. It is unclear whether this adequately encapsulates efficiency.

What was the research question?
Can the use of multiple clinical metrics allow programs to better contextualize the meaning of resident efficiency in the ED?

What was the major finding of the study?
For each 50% increase in the odds of treating a high-complex case, there was a 7.4% (0.79–13.6%; P = 0.03) decrease in mean PPH.

How does this improve population health?
Residents who see more PPH may not treat as many complex patients, which could have implications for their readiness for independent practice.

METHODS

Study Setting

The study was conducted at a single three-year EM residency program associated with an urban, academic ED located in the Midwestern US. The hospital in which the ED is situated is a Level I adult and pediatric trauma, burn, stroke, and STEMI center. The ED has 43 adult beds and sees approximately 60,000 patient visits per year. During the study period, the residency had 12 PGY-1 positions each year.

The adult ED is divided into three separate treatment areas with two primary treatment teams. Each treatment team consists of a single attending physicians as well as 2–3 PAs or resident physicians. Shifts are nine hours in duration. Throughout most of the study period, patients were treated by the team of physicians designated to that treatment area. In 2019, the ED shifted to a model in which either treatment team could care for any patient in either treatment area. Each treatment team is staffed by residents of any PGY level with at least one senior resident (PGY-2 or PGY-3). All residents were encouraged to assign themselves to patients of any acuity level. During the study, PAs were employed in the ED and could take the place of a resident on shift (especially during weekly resident didactics). The APPs had no additional restrictions or privileges compared to residents in assigning themselves to patients.

As staffing is variable, there are no specific number of patients that each resident is required to see per shift. All residents staff directly with the attending; no residents supervise other residents. During expected peak times (of patient arrival), a triage team consisting of a single attending physician and a PA is also present and generally sees the lowest acuity patients; all residents are assigned approximately the same number of shifts but may freely trade shifts among themselves. While attending physicians can assign themselves to patients primarily (ie, no resident or APP assigned), this is a rare occurrence and typically occurs only during times of excessive patient volume or acuity.

Study Design and Population

We designed this study as a retrospective observational study using aggregated, resident case data extracted from the electronic health record (EHR) (Epic Systems, Verona, WI). Data for PGY 1–3 residents were extracted for four consecutive classes of residents who graduated between 2017–2020. To remove significant outliers we excluded residents if they did not graduate from the program within three consecutive years. We collected data on the characteristics of the patients seen as well as markers of residency efficiency for all available patient encounters during the study period (Table 1). Multiple metrics were used to provide a more accurate measure of patient complexity rather than a single metric in isolation. The research team was composed of a senior resident (TB) and a departmental data analyst (DH), as well as faculty educators (CJ, AN, BS). We chose the selected markers as they have been used as markers of resident clinical efficiency in other studies.[6,10]

Patient care was attributed to the first assigned resident, as this resident is typically the most cognitively and practically involved in the patient's care. Patients who are signed out to an oncoming ED team are shared equally among all oncoming residents. We excluded pediatric patient encounters (ie, patients <18 years of age) as pediatric cases have substantial differences in terms of the resources and cognitive load required to provide adequate care. Therefore, it was determined that the chosen efficiency metrics could not be meaningfully compared to adult patient encounters.[13] For example, the average length of stay between pediatric and adult encounters during the study period was 219 vs 362 minutes. Over the course of their training, residents complete a dedicated block of pediatric ED shifts during their first and second years and complete an additional 1–3 pediatric ED shifts during each adult ED rotation. We calculated the percentage of patient encounters compared to overall patient encounters.

Given the aggregated nature of the data that did not contain any patient protected health information or identifying resident data, no informed consent was collected. The data was extracted from the EHR by the departmental data analyst and was stored on a password-protected departmental server available only to members of the study team. No additional chart review was conducted on the included encounters. This study was determined to be quality improvement and exempt from formal review by our institutional review board.

Statistical Analysis

We calculated the PPH for each PGY-3 resident by using the total number of adult patient encounters for which they were the first resident assigned, divided by the total number of hours worked in the adult section of the ED. Residents were grouped based on the year of graduation. A two-sided significance level of $P < 0.05$ was used for all statistical tests. We performed all statistical analyses and graphics using R version 4.1.1 (R Core Team, R Foundation for Statistical Computing, Vienna, Austria). We used negative binomial regression to assess the relationship between PPH and the odds of treating a patient who required admission, adjusted

Table 1. Emergency medicine resident metrics of efficiency and the characteristics of patients seen.

Metric	Description
Patient characteristics	
Emergency Severity Index (ESI)	Frequency of patient encounters matching each ESI score (1–5). This is a means of estimating time and resource allocation for a patient based on their initial presentation.
Evaluation and management (E/M) Current Procedural Terminology (CPT) codes	Frequency of patient encounters receiving each E/M CPT code (99281–99285). These represent a means of determining patient complexity based on meeting certain documentation criteria.
Hospital admission	Number of patient encounters in which an inpatient admission occurred
Efficiency metrics	
Relative value units (RVU)	Total number of work RVUs generated
Patients seen per hour	Total number of patients seen divided by total number of hours worked in the ED during PGY-3

ED, emergency department; *PGY*, postgraduate year.

for hours worked and patient complexity. All analyses were performed at the resident level.

To determine the relationship between ESI and PPH, we first dichotomized ESI into high and low severity. High severity included encounters from the third year of residency that were labeled ESI 1 and 2 and low severity included encounters that were labeled ESI 3, 4, and 5. The ESI 1 encounters were not separately analyzed as these are relatively rare compared to the overall number of patient encounters. We then calculated the odds of treating a patient with a high-severity ESI. The relationship between CPT codes and PPH was similarly calculated by dichotomizing CPT into more and less complex. More complex included the highest complexity CPT code (99285), and less complex included the remaining four codes (99281–99284). We did not consider CPT code 99291 as only attendings can bill for critical care, and there is significant variation within our attending group in the use of critical care billing. Therefore, we believed that this was less likely to be a resident-sensitive metric. We similarly calculated the odds of treating a patient with a more complex CPT. To assess significant differences among PGY that could introduce bias, we used the Kruskal-Wallis test and the Nemenyi procedure for post-hoc comparisons.[14]

We used RVUs as a proxy for shift complexity and regressed that as the response in a multivariable regression model using PPH, PGY, and the interaction between PPH and PGY as explanatory variables.

RESULTS

A total of 46 residents met inclusion criteria. One resident was excluded who had a non-consecutive training period, and another resident left the program prior to graduation at the end of their PGY-1 year. Overall, 1.6% of the total patient encounters were assigned 99291/99292 CPT codes and were excluded from that analysis. An additional 17.6% of total patient encounters, consisting of pediatric cases, were also excluded, leaving a total of 178,037 patient encounters. Average PPH data for the four included PGYs can be seen in Table 2. The average ESI during the study period was 2.8.

Current Procedural Terminology

Adjusted for class year, a 50% increase in the odds of treating a complex case was associated with the mean PPH decreasing 7.42% (95% confidence interval [CI] 0.79–13.6% reduction in mean PPH; $P = 0.03$). The relationship between PPH and odds of treating a high-complexity case can be seen in Figure 1.

Hospital Admission

Each 50% increase in odds of treating a case requiring hospital or intensive care unit [ICU]/intermediate care unit admission was associated with a 6.7% (95% CI 0.73–12%; $P = 0.03$) reduction in mean PPH. The relationship between PPH and odds of treating a case requiring admission can be seen in Figure 2.

Table 2. Patients seen per hour data for class years 2017–2020.

Class year	Academic year	Mean PPH (95% CI)
2017	2014–2015 PGY-1	1.20 (1.13–1.28)
	2015–2016 PGY-2	1.51 (1.42–1.61)
	2016–2017 PGY-3	1.52 (1.43–1.62)
2018	2015–2016 PGY-1	1.11 (1.05–1.16)
	2016–2017 PGY-2	1.50 (1.43–1.58)
	2017–2018 PGY-3	1.45 (1.39–1.52)
2019	2016–2017 PGY-1	1.08 (1.03–1.13)
	2017–2018 PGY-2	1.37 (1.31–1.44)
	2018–2019 PGY-3	1.26 (1.21–1.32)
2020	2017–2018 PGY-1	1.01 (0.96–1.05)
	2018–2019 PGY-2	1.33 (1.28–1.39)
	2019–2020* PGY-3	1.09 (1.04–1.14)

*May have been impacted by the COVID-19 pandemic.
CI, confidence interval; *PPH*, patients seen per hour; *PGY*, postgraduate year.

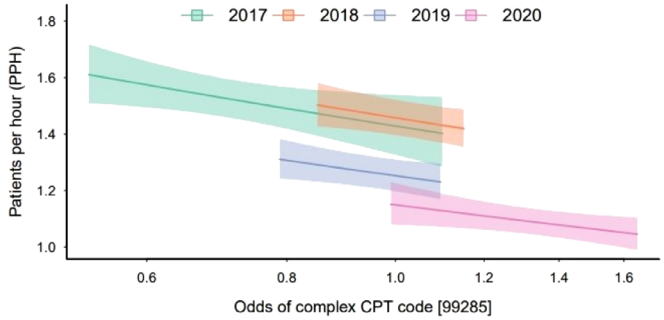


Figure 1. Relationship between odds of treating a high-complex case and mean patients seen per hour during postgraduate year-3, grouped by graduation year. Shaded regions represent 95% confidence intervals.
CPT, Current Procedural Terminology.

Emergency Severity Index

After controlling for PGY, there was no significant relationship observed between PPH and the odds of treating a high acuity case ($P = 0.30$).

Relative Value Units

The models suggested that each 0.1 point increase in PPH is associated with a 262 unit increase (95% CI 157–367; $P < 0.001$) in average work RVUs generated, with the association between average total RVU and PPH stable across the four years. See Figure 3 for the relationship between RVUs generated and PPH.

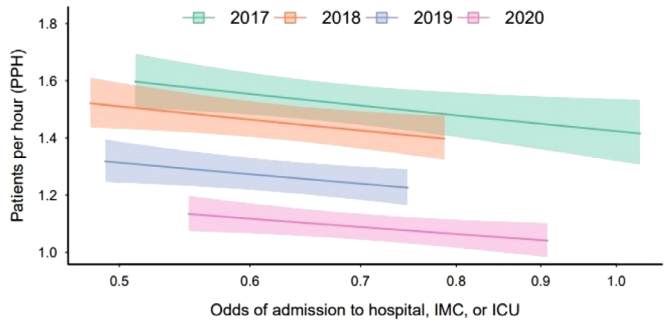


Figure 2. Relationship between odds of a case resulting in admission and mean patients seen per hour during postgraduate year 3, grouped by graduation year. Shaded regions represent 95% confidence intervals.
IMC, intermediate care unit; *ICU*, intensive care unit.

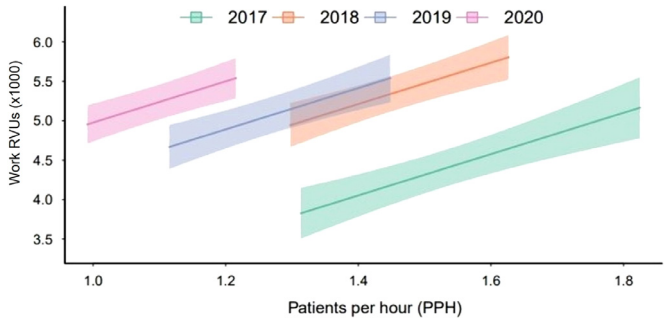


Figure 3. The relationship between relative value units generated and patients seen per hour during postgraduate year 3, grouped by graduation year. Shaded regions represent 95% confidence intervals.
RVU, relative value units.

DISCUSSION

Residents seeing higher numbers of patients saw fewer complex patients and fewer patients requiring an inpatient admission. We believe this study is the first to examine the association of patient complexity and acuity on the clinical efficiency with which EM residents operate. As suggested by cognitive load theory, we found that residents' capacity to pick up complex patients in this study was finite. More complex patients and patients requiring admission may impose more of a task load (eg, phone calls to consultants or admitting physicians, review of records, or longer history-taking) than patients with lower acuity. This greater cognitive load could result in a decrease in PPH as complexity goes up. This effect may be mitigated somewhat by a variety of effective clinical practices, such as partnering with nurses or assistance from their supervising attending. However, more research is needed to determine whether other factors, such as the incorporation of evidence-based efficiency practices or adding scribes for documentation, may affect resident efficiency.

Our data shows that PPH rises sharply between PGY-1 and -2 years and then plateaus between the PGY-2 and -3 years. This finding is in line with previous literature.[11] While the underlying cause of this finding is ultimately unknown, it may be secondary to changes in focus that occur between the latter years in training. For example, any further increases in the ability of PGY-3 residents to see additional patients over a PGY-2 resident may be offset by a focus on departmental flow, instruction of junior learners, or simply succumbing to "senioritis." It is also possible that the most senior residents preferentially selected the most critically ill patients in the ED and the increased complexity of these patients were the reason for the plateau.

We found no significant relationship between PPH and ESI. However, there was a negative relationship when evaluating PPH and CPT codes as well as the likelihood of caring for a patient who would need to be admitted. This may be because ESI is assigned at the beginning of the patient's treatment course, whereas CPT designation and admission decisions are made later in the patient's course (or after the conclusion of the encounter in the case of CPT). The ESI was also treated as a binary variable for analysis, with ESI 3 treated as a low-acuity patient. However, many of these patients may have a higher acuity illness; it is possible that this dichotomization eliminated a true effect that would otherwise have been seen. Therefore, it could reflect that ESI could not be used to accurately estimate the amount of resources and cognitive effort required to care for these patients.[15]

While we did not analyze the relationship between patient complexity and overall generation of RVUs, it remains an interesting avenue for future research. While it makes intuitive sense that the care of a single, more complex patient would generate more RVUs than a single, less complex patient, it is unknown whether RVU generation is balanced by the increased amount of time and cognitive load these patients often require. This was not done in the current study as this would also have depended on hospital crowding, which is a confounding variable we chose not to include.

Overall, our results suggest that the use of PPH as a surrogate measure of patient efficiency may paint an incomplete picture of resident performance. While the current study did demonstrate a statistically significant relationship between patient complexity and PPH, the clinical significance is unclear. The required number of patients seen during training represents a critically unexplored area of residency training. Experiential learning theory would suggest that seeing a greater number of patients would result in a higher level of competence, but this may be mediated by complexity or other factors. Residency leadership teams who plan to evaluate their residents on their ability to task switch between multiple patients (ACGME Milestone PC7) may wish to explore the use of other markers that may correlate with PPH. These may better capture the

complexity of the care provided, although further study is required before this can be considered best practice.

LIMITATIONS

An important limitation of this study is its single-center design. The results seen may be due to unique factors of the study site and, therefore, may not be generalizable to other sites. For example, the study site changed from a pod-based model in 2019, which may have restricted the efficiency of some residents, to a "free-for-all" model where residents could assign themselves to new patients as soon as they were ready. Additionally, there may have been subtle changes to the patient population seen by the residents over the years, or changes to the residency, that were not assessed in the current study. For example, the final year of the study data included a few months that were affected by the COVID-19 pandemic. This would only have impacted a small portion of the final year of training for the Class of 2020. However, it may have led to the discrepancy seen in PPH between the Class of 2020 and the other included classes as seen in Figure 3. It is interesting that this did not result in a substantial change in RVUs generated. No specific documentation interventions were implemented during this time and may simply represent general changes in documentation practices.

We did not factor in how patients who were taken in sign-out would affect the utilized metrics. It is likely that residents who were signed out patients requiring multiple additional actions (such as consultation calls, procedures, etc) would negatively impact their ability to take on new patients. These cases were excluded because it would have been unfeasible to account for how much additional work was required for these patients. For example, some patients, even those who were critically ill, may be signed out when all major diagnostic and therapeutic interventions have already been completed, and the patient is simply awaiting transfer to the hospital floor.

We did not consider patients who were specifically admitted to our step-down ICU units, or those who went directly to the operating room. While the rate of admission to these locations could certainly imply a level of complexity, the way this is determined varies greatly between institutions and would have added a significant layer of complexity to the current study. At our institution, we have two affiliated hospitals that we can admit patients to, each with different levels of capabilities and different criteria for ICU/stepdown unit status. This represents an interesting avenue of future study.

We also excluded patients assigned CPT codes 99291 and 99292 (which denote critical care) from our analysis of the relationship between PPH and CPT codes. This was done as critical care billing can only be done by the attending physician, and documentation practices for this are variable within our attending group. The overall percentage of patients who received 99291 or 99292 CPT codes was only 6%. However, these patients were not excluded entirely and would have been included in the analysis of other metrics apart from CPT. As stated earlier, the use of multiple metrics in this study was designed to overcome limitations in individual metrics alone.

It is possible that the presence of triage physician during peak hours of patient arrival may have impacted the metrics used in this study. While this was not specifically controlled for, the triage physician team primarily sees only the lowest acuity patients (eg, simple laceration repairs, ankle sprains, needlestick injuries) and was felt to not have a big impact on our chosen metrics. We did not wish to exclude shifts in which the triage physician was present as this timeframe represents the highest patient census in our ED. If an impact occurred, this would be expected to decrease the magnitude of the relationship between PPH and the chosen variables. Despite this, a significant effect was still demonstrated.

Finally, this numerical data does not completely encapsulate other factors that would influence a resident's overall efficiency. These factors could include their clinical abilities and medical knowledge. Because of this, we caution residency programs from looking at the variables investigated in this study in isolation when assessing their own trainees.

CONCLUSION

Residents caring for higher numbers of patients per hour were associated with fewer complex patients and patients who required inpatient admission.

Address for Correspondence: Corlin M. Jewell, MD, University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, 800 University Bay Dr., Madison, WI 53705. Email: cmjewell@medicine.wisc.edu

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Jewell et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Beeson MS, Ankel F, Bhat R, et al. The 2019 Model of the Clinical Practice of Emergency Medicine. *J Emerg Med.* 2020;59(1):96–120.
2. Accreditation Council for Graduate Medical Education. ACGME Common Program Requirements (residency). 2022. Available at:

https://www.acgme.org/globalassets/pfassets/programrequirements/cprresidency_2023.pdf. Accessed February 25, 2024.
3. Sørup CM, Jacobsen P, Forberg JL. Evaluation of emergency department performance – a systematic review on recommended performance and quality-in-care measures. *Scand J Trauma Resusc Emerg Med.* 2013;21:62.
4. Wiler JL, Welch S, Pines J, et al. Emergency department performance measures updates: Proceedings of the 2014 Emergency Department Benchmarking Alliance Consensus Summit. *Acad Emerg Med.* 2015;22(5):542–53.
5. Joseph JW, Davis S, Wilker EH, et al. Modelling attending physician productivity in the emergency department: a multicentre study. *Emerg Med J.* 2018;35(5):317–22.
6. Kirby R, Robinson RD, Dib S, et al. Emergency medicine resident efficiency and emergency department crowding. *AEM Educ Train.* 2019;3(3):209–17.
7. Young JQ, Van Merrienboer J, Durning S, et al. Cognitive load theory: implications for medical education: AMEE Guide No. 86. *Med Teach.* 2014;36(5):371–84.
8. Graber ML, Kissam S, Payne VL, et al. Cognitive interventions to reduce diagnostic error: a narrative review. *BMJ Qual Saf.* 2012;21(7):535–57.
9. Rothschild J, Landrigan C, Cronin JW, et al. The critical care safety study: the incidence and nature of adverse events and serious medical errors in intensive care. *Crit Care Med.* 2005;33(8):1694–700.
10. Hamden K, Jeanmonod D, Gualtieri D, et al. Comparison of resident and mid-level provider productivity in a high-acuity emergency department setting. *Emerg Med J.* 2014;31(3):216–9.
11. Douglass A, Yip K, Lumanauw D, et al. Resident clinical experience in the emergency department: patient encounters by postgraduate year. *AEM Educ and Train.* 2019;3(3):243–50.
12. AMA CPT International. Relative Value Units. Available at: https://cpt-international.ama-assn.org/relative-value-units. Accessed October 25, 2024.
13. Heaton HA, Nestler DM, Jones DD, et al. Impact of scribes on patient throughput in adult and pediatric academic EDs. *Am J Emerg Med.* 2016;34(10):1982–5.
14. Nemenyi P. *Distribution-free Multiple Comparisons*. Princeton, NJ: Princeton University, 1963.
15. Sax DR, Warton EM, Mark DG, et al. Evaluation of version 4 of the Emergency Severity Index in US emergency departments for the rate of mistriage. *JAMA Netw Open.* 2023;6(3):e233404.

The Effect of Hospital Boarding on Emergency Medicine Residency Productivity

Peter Moffett, MD
Al Best, PhD
Nathan Lewis, MD
Stephen Miller, DO
Grace Hickam, MD
Hannah Kissel-Smith, MD
Laura Barrera, MD
Scott Huang, MD
Joel Moll, MD

Department of Emergency Medicine, Virginia Commonwealth University School of Medicine, Richmond, Virginia

Section Editors: Abra Fant, MD
Submission history: Submitted July 21, 2024; Revision received October 7, 2024; Accepted October 11, 2024
Electronically published November 27, 2024
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.31064

Introduction: Emergency department boarding has escalated to a crisis, impacting patient care, hospital finances, and physician burnout, and contributing to error. No prior studies have examined the effects of boarding hours on resident productivity. If boarding reduces productivity, it may have negative educational impacts. We investigated the effect of boarding on resident productivity as measured by patients per hour and hypothesized that increased boarding leads to decreased productivity.

Methods: This was a retrospective study at a quaternary, urban, academic Level I trauma center from 2017–2021 with a three-year emergency medicine residency of 10–12 residents per year and annual volumes of 80,000–101,000. Boarding was defined as the time between an admission order and the patient leaving the ED. We created a multivariable mixed model with fixed covariates for year, month, day of week, resident experience, shift duration, total daily ED patients, and with residents as repeated measures. The effect of boarding was estimated after covarying out all other factors.

Results: All variables included in the model were significantly associated with changes in productivity. Resident experience has the largest effect such that for each month of residency experience, a resident adds 0.012 patients per hour (95% confidence interval [CI] 0.010–0.014). Isolating the effect of boarding demonstrated that for every additional 100 hours of boarding, a resident's productivity decreased by 0.022 patients per hour (95% CI 0.016–0.028). In the study, the median daily boarding was 261 hours; if this were eliminated (assuming a resident completes 100 10-hour shifts annually), a resident could be expected to see 56.9 more patients per year (95% CI 40.7–73.1).

Conclusion: Hospital boarding significantly reduces resident productivity as measured by patients per hour. Further studies are warranted to determine the educational impact. [West J Emerg Med. 2025;26(1)53–61.]

INTRODUCTION

Emergency department (ED) boarding (defined as patients admitted to the hospital but remaining in the ED) has reached critical levels and has been declared a crisis by the American College of Emergency Physicians.[1] The scope of the crisis is daunting with effects on patient care, errors, physician burnout, hospital economic stress, and ambulance diversion.[2] Increased ED boarding also leads to increases in

medication errors, time to antibiotics, time to percutaneous coronary intervention for patients with myocardial infarction, time to care for patients with acute stroke, patient mortality, and risk-adjusted hospital spending, and has effects on all levels of acuity.[3–10]

Within the context of boarding, EDs must also provide sound educational training involving both quality and quantity of patient experiences. Residency programs seek to improve efficiency and productivity in their residents throughout their training. Many variables have been associated with resident productivity including time of shift, shift length, and resident experience.[11–13] There are, however, few studies that evaluate the effect of ED crowding and boarding time on the effect of emergency medicine (EM) resident productivity.[14] If boarding decreases the number of patients seen during a residency, there may be an impact on resident education.

In this study we aimed to investigate the effect of boarding on EM resident productivity as measured by patients per hour. We hypothesized that increased hospital boarding would result in decreased resident productivity.

Population Health Research Capsule

What do we already know about this issue?
Emergency department boarding negatively impacts patient care, hospital efficiency, and physician well-being.

What was the research question?
Does increased ED boarding reduce emergency medicine resident productivity, as measured by patients per hour?

What was the major finding of the study?
For every additional 100 hours of ED boarding, a resident's productivity decreased by 0.022 patients per hour (95% CI 0.016–0.028); a resident sees 57 fewer patients per year due to boarding.

How does this improve population health?
Understanding the negative effects of boarding on productivity may help policy makers find solutions to improve patient flow, patient care, resident education, and overall health outcomes.

METHODS

Study Design and Setting

This was a retrospective study conducted at the Virginia Commonwealth University Health System, the only comprehensive Level I trauma center in Richmond, VA. During the study period from January 2017–June 2021, the total patient volumes ranged from 80,000–101,000 per year. On average, 30% of patients were admitted to the hospital, of whom 5% went to the intensive care unit. Patients <18 years of age constituted 22% of the total volume. The department is staffed with board-certified emergency physicians, and during the study period 81% of patients were seen by a resident. The remaining non-resident cases were seen by advanced practice practitioners (APP) in a low-acuity area of the ED or by attending physicians and were not included in the study. Throughout the study there was no change in this staffing model such that APPs were never competing for the same patients as residents. The department has 76 beds with 35 in an acute area, 10 in trauma/resuscitation, 10 in a mid-track area, 16 in a pediatric department, and five in a fast-track zone.

Our residency program is three years in length, and class sizes ranged from 10 residents in 2017 to 12 residents in 2021. During postgraduate years (PGY)-1, 2, and 3, residents work in the ED for 26 weeks, 29 weeks, and 35 weeks, respectively. Resident shift lengths varied from 9–12 hours with the most typical shift being 10 hours. On average, each 24-hour period had a total of 137 hours of resident coverage in overlapping shifts. The EM residents saw patients in all Emergency Severity Index (ESI) categories and were the primary physicians for all emergent patients (ESI 1 and 2). Residents cared for patients in all areas of the ED other than the low-acuity area. All residents staff patients directly with an attending physician without oversight by a more senior resident; therefore, the productivity numbers for residents in all three years of training are independent.

The study was granted exempt status by the Virginia Commonwealth University Institutional Review Board (HM20024717).

Selection of Participants

Data from all patients evaluated by an EM resident was captured in a database, and in conjunction with scheduling data it was used to determine the average number of patients per hour. Only EM residents were included. The study period was selected as this was the maximum amount of time for which data was available prior to the hospital switching to a new electronic health record. As the database was initially created to provide feedback to residents, certain data was removed and not available to us for analysis. Information from the first month of EM for each resident was not provided, and due to initial effects from the COVID-19 pandemic, data from April–July 2020 was not included.

Measurements

We combined three databases for analysis: the patient database of all ED encounters; the resident scheduling database; and the hospital boarding database.

During the study period, the EM residency program received monthly, system-generated reports listing the unique patient identifier, name of the resident assigned to care for the patient, the ESI acuity level, the date/time of first contact and check out, and the disposition. The resident assignment was derived from tracking board data, and in scenarios where multiple residents were assigned to a patient encounter, only the first resident assigned was credited for each unique patient encounter. The EM residents were scheduled for 9-hour, 10-hour, or 12-hour shifts during the study period. All non-EM residents and staff were excluded from the patient database.

Boarding data was reported daily from hospital analytics. The number of hours of boarding was defined as the time between an admission order and when the patient left the ED. Boarding hours was selected as this was the variable available to us from the hospital analytics database.

Outcomes

We designed a model to isolate the effects of ED boarding on resident productivity as measured by patients per hour. Patients per hour was defined as the total number of new patients seen during the shift divided by the duration of the shift in hours. The covariates were chosen from those found in previous studies to be related to resident productivity.[11,13,15,16] These included year, month, day of the week, cumulative residency months in training, shift duration, total patients per day, and boarding. Months in training was chosen as a continuous covariate to delineate resident experience rather than the rough classification of PGY-1, -2, or -3 based on the observation that resident productivity begins low in the PGY-1 year, increases in the PGY-2 year, and then plateaus. This monthly experience variable was modeled using cubic regression.

Analysis

We described the data using counts and percentages. Patients per hour was modeled using a multivariable mixed model, with covariates defined as fixed effects and residents as repeated measures. We used an autoregressive (AR1) covariance structure to account for the dependence between repeated measures. The fixed effects were year (reference = 2019), month (reference = 12), day of the week (reference = Thursday), resident month in training (centered on 18), total patients per day/100, shift duration, and daily boarding hours/100. We chose the year 2019 as a reference as it was the last full year of data prior to the start of the COVID-19 pandemic. December was chosen as it aligns with the 18th month of residency, which is when productivity plateaued in our model. Thursday was selected as it is thought to represent the day with the most ideal flow since it avoids weekends, Monday, and Friday patient surges, as well as Wednesday morning didactics when EM residents are not working clinically. The total patients per day, shift duration, and boarding hours were referenced at the median values in our dataset.

We estimated the effect of boarding from the marginal regression model after covarying out all other factors. Estimates are described using 95% confidence intervals. All data management and analysis were performed using SAS software (version 9.4 and JMP Pro version 17.2 (SAS Institute Inc, Cary, NC).

RESULTS

Characteristics of Study Subjects

During the study period, 263,058 patients were seen in the ED by 601 clinicians including the 80 EM residents studied. During the 49 months studied between 2017–2021, EM residents were scheduled to 16,949 shifts and were assigned 188,685 patients (Table 1). Total daily patient volume varied considerably during this time (mean 177, SD 26, range

Table 1. Characteristics of the emergency department residents' shifts and patients evaluated (January 2017–June 2021).

Characteristic	Shifts N	Patients N	(%)
Total	16,949	188,685	
Year			
2017	3,496	44,119	(23)
2018	3,955	47,569	(25)
2019 (11 months)*	4,053	47,035	(25)
2020 (8 months)†	3,101	29,191	(15)
2021 (6 months)	2,344	20,771	(11)
Month			
1- January	1,909	21,052	(11)
2- February	1,576	18,004	(10)
3- March	1,680	18,901	(10)
4†- April	1,302	15,229	(8)
5†- May	1,371	16,385	(9)
6†- June	1,337	15,191	(8)
7†- July	820	10,129	(5)
8- August	1,560	15,543	(8)
9- September	1,376	14,741	(8)
10- October	1,431	15,299	(8)
11*- November	1,062	11,639	(6)
12- December	1,525	16,572	(9)
Day of week			
Sunday	2,249	25,887	(14)
Monday	2,679	29,099	(15)
Tuesday	2,756	29,504	(16)
Wednesday‡	1,989	21,970	(12)
Thursday	2,601	27,874	(15)

(*Continued on next page*)

Table 1. Continued.

Characteristic	Shifts N	Patients N	(%)
Friday	2,525	28,785	(15)
Saturday	2,150	25,566	(14)
Shift			
7 AM to 5 PM	1,688	16,332	(9)
7 AM to 7 PM	180	2,512	(1)
9 AM to 7 PM	2,546	28,306	(15)
12 PM to 10 PM	3,386	38,586	(20)
2 PM to 12 AM	2,470	28,631	(15)
3 PM to 12 AM	3,553	41,138	(22)
9 PM to 7 AM	3,126	33,180	(18)
PGY			
PGY-1[§]	5,162	44,817	(24)
PGY-2	4,756	57,447	(30)
PGY-3	7,031	86,421	(46)
Disposition			
Admitted		74,663	(40)
Discharged		114,022	(60)

*November 2019 was excluded as the hospital information management system was down.
[†]April 2020 through July 2020 was excluded due to COVID-19 and hospital changes.
[‡]Wednesdays mornings are resident didactics.
[§]The first month of a residency was excluded (orientation month).
ESI, Emergency Severity Index; *PGY*, postgraduate year.

88–263). As indicated in the table, the ED experienced a patient count variability that changed across years, months, days of the week, shifts, and PGY level. Of all 188,167 patients seen by EM residents, 40% were admitted.

Boarding hours per day varied considerably (mean 281, SD 127, range 50.8–914.4; Figure 1). The hospital information system calculated boarding hours daily; however, across the 1,490 days studied, there were six impossible (negative) values and nine very low values. Low values were identified by large residuals in the multiple regression model. Rather than treating these as missing values, we used a multiple regression model to impute the 15 values in question.

Main Results

All the factors in the repeated-measures mixed-model were significant ($P < 0.001$). Table 2 shows the estimated effect of each term in the model. The joint effect of all the factors on resident productivity is shown in Figure 2. These profile plots show the marginal model predicted value of resident productivity on the vertical axis across all the covariates on the separate horizontal axes. The importance

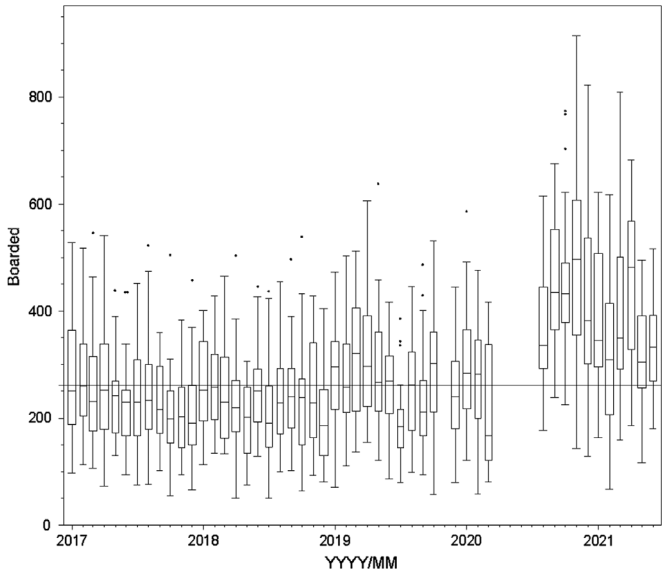


Figure 1. Boarding across study years.
Line set at median boarding hours across the entire study period (261 hours/day).
Each box plot represents a month (line = median, box = 25th to 75th quartile, whiskers = typical extremes, circles = outliers).
Note: April 2020–July 2020 hours are not available as they correspond to the beginning of the COVID-19 pandemic.

of a factor is visualized by the steepness of the prediction trace.

Isolating the effect of boarding demonstrated that for every additional 100 hours of daily departmental boarding, individual resident productivity decreased by 0.022 patients per hour (95% confidence interval [CI] 0.016–0.028, Table 2). In the reference standard scenario, a resident could be expected to see 1.10 patients per hour with boarding at the daily median (261 hours) but could see 1.15 patients per hour if boarding were eliminated (Figure 2, Panel C). Table 3 shows how resident productivity was degraded by boarding across the range of values seen at our institution. A resident would see 1.14 patients per hour when boarding was at the lowest in the study compared to 0.95 patients per hour at the maximum level of boarding seen in the study, which is a difference of 0.19 patients per hour (95% CI 0.15–0.22). Assuming a resident completes approximately 100 shifts a year that are of 10 hours duration and boarding was eliminated, then a resident could be expected to see 56.9 more patients per year (95% CI 40.7–73.1). This would represent a 5% increase in patient volume per resident annually.

Resident experience has the largest effect on resident productivity. Resident productivity was low initially at 0.5 patients per hour (95% CI 0.46–0.54) by the second month of training (Figure 2). Improvement was initially rapid to 0.75 patients per hour at seven months, then plateaued near the 18-month point (1.10 patients per hour) to finally reach 1.12 patients per hour at the end of the 36 months (95% CI 1.08–1.17). When evaluating our data by PGY level, our

Table 2. Multiple regression results predicting new patients per hour per resident for each variable.

Effect	Estimated new patients per hour	Standard error	95% CI
Intercept	1.0957	0.0173	1.0618 to 1.1297
Year			
2017	0.1501	0.0122	0.1262 to 0.1740
2018	0.0837	0.0117	0.0608 to 0.1065
2019	[reference]		
2020	−0.0641	0.0137	−0.0909 to −0.0373
2021	−0.1682	0.0156	−0.1987 to −0.1377
Month			
1- January	0.0635	0.0172	0.0298 to 0.0972
2- February	0.0776	0.0182	0.0420 to 0.1133
3- March	0.0498	0.0181	0.0144 to 0.0852
4- April	0.0840	0.0197	0.0453 to 0.1227
5- May	0.0750	0.0196	0.0366 to 0.1133
6- June	0.0585	0.0201	0.0191 to 0.0979
7- July	−0.0077	0.0219	−0.0507 to 0.0353
8- August	0.0550	0.0185	0.0188 to 0.0912
9- September	0.0654	0.0187	0.0288 to 0.1021
10- October	0.0487	0.0184	0.0127 to 0.0847
11- November	0.0486	0.0199	0.0095 to 0.0876
12- December	[reference]		
Day of the week			
Sunday	0.0587	0.0118	0.0357 to 0.0818
Monday	−0.0312	0.0118	−0.0542 to −0.0082
Tuesday	0.0122	0.0110	0.0094 to 0.0338
Wednesday	0.1094	0.0123	0.0854 to 0.1334
Thursday	[reference]		
Friday	0.0475	0.0109	0.0261 to 0.0688
Saturday	0.1182	0.0120	0.0948 to 0.1417
Resident months (linear)*	0.0122	0.0010	0.0101 to 0.0142
(quadratic)	−0.0011	0.0000	−0.0012 to −0.0010
(cubic)	0.00003	0.00001	0.00002 to 0.00004
Total patients per day (per 100 patients)*	0.4021	0.0165	0.3697 to 0.4344
Shift duration*	−0.1277	0.0070	−0.1413 to −0.1140
Boarded (per 100 hours)*	−0.0218	0.0032	−0.0280 to −0.0156

The mixed-model also included resident as a repeated-effect with an AR(1) covariance structure.
*Continuous covariates were referenced to the median value. Median resident month = 18, total patients per day/100 = 1.77, shift duration = 10 hours, boarded hours/100 = 2.61.
CI, confidence interval.

PGY-1 residents saw 0.75 per hour, PGY-2 residents saw 1.10 patients per hour, and PGY-3 residents saw 1.12 patients per hour.

Total patients per day presenting to the ED was the next most important factor in resident productivity. For every 100 new patients presenting to the ED, an individual resident would be expected to add 0.40 patients per hour (95% CI 0.37–0.43). The median value for daily total patient volume was 177 patients per day, but a low-volume day at the 10th percentile (143 total patients) resulted in a corresponding decrease in resident productivity to 0.96 patients per hour (95% CI 0.92–1.00). For a high-volume day at the 90th

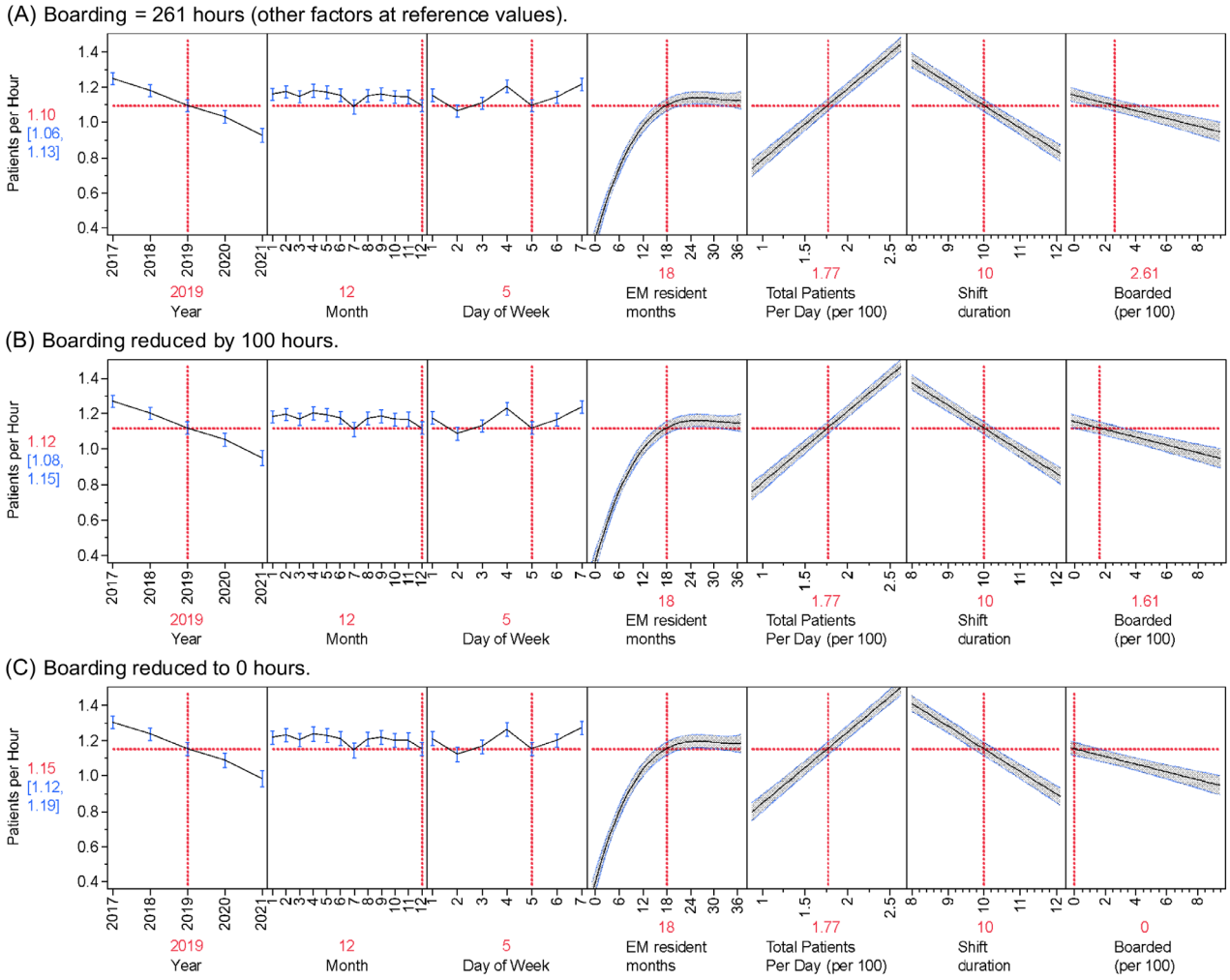


Figure 2. Multiple regression results predicting new patients per hour per resident for each variable.
All values (year, month, day of week, EM resident months, total patients, shift duration) in model held at reference standards with adjustments to boarding (last panel of each graph). Expected patients per hour in each scenario is indicated by the red number in the Y axis with 95% confidence intervals in blue. As boarded hours change (last panel of each graph) so do patients per hour (red number to left of each graph) in each of the three scenarios (A: Median boarding of 261 hours. B: Reducing boarding by 100 hours. C: Eliminating boarding hours.)

percentile (210 patients), resident productivity increased to 1.23 patients per hour (95% CI 1.19–1.26).

Resident productivity also changed based on the year, shift duration, and day of the week. Resident productivity was highest in 2017 at 1.25 patients per hour (95% CI 1.21–1.28) and steadily decreased to the 0.93 patients per hour seen in 2021. Resident productivity for a nine-hour shift was predicted to be 1.21 patients per hour

Table 3. Estimated resident productivity by boarding hours.

Cutoff	Boarded (hours)	Estimated patients per hour	Standard error	95% CI
Maximum	914	0.954	0.027	0.900 to 1.007
75th percentile	351	1.076	0.018	1.042 to 1.111
Median	261	1.096	0.017	1.062 to 1.130
25th percentile	189	1.111	0.017	1.077 to 1.146
Minimum	51	1.141	0.018	1.105 to 1.178
No boarding	0	1.153	0.019	1.115 to 1.190

Marginal estimates from the mixed model with the following factors held constant: year = 2019, month = 12, day of the week = 5 (Thursday), resident month in training = 18, total patients per day/100 = 1.77, shift duration = 10 hours.
CI, confidence interval.

(95% CI 1.19–1.26), whereas for a 12-hour shift it was predicted to be 0.84 patients per hour (95% CI 0.80–0.89). Saturdays and Wednesdays averaged approximately 1.21 patients per hour, Sundays, and Fridays approximately 1.15 per hour, and Mondays, Tuesdays, and Thursdays 1.10 patients per hour.

Month-to-month variability had the smallest effect on resident productivity. Compared with the other months, July and December had lower resident productivity (1.09 vs 1.16 patients per hour).

DISCUSSION

To our knowledge, this is the first study to demonstrate that there is a significant reduction in resident productivity (measured as patients per hour) due to hospital boarding in the ED. In our model, this resulted in a decrease of 0.022 patients per hour (95% CI 0.016–0.028) for every 100 hours of daily boarding. While performed at a single institution, our dataset broadly aligns with multiple studies previously completed regarding resident productivity. In our study, we analyzed resident experience as the number of months in training rather than divided into PGY level. This was based on our observation that productivity rapidly increased during the PGY-1 year and then plateaued in the middle of the PGY-2 year.

When evaluating our data by PGY level, our PGY-1 residents saw 0.75 patients per hour, PGY-2 residents saw 1.10 patients per hour, and PGY-3 residents saw 1.12 patients per hour. Prior studies have demonstrated similar patterns with PGY-1 to -3 residents seeing between 0.79–0.81 patients per hour, 1.05–1.2 patients per hour, and 1.22–1.27 patients per hour, respectively.[17–19] A study by Henning et al showed rapid progression from PGY-1 to PGY-2 year and then gradual progression in PGY-3 year but was based on patients per day.[20] Similarly, a study by Turner-Lawrence and Todd saw increasing productivity from 1.2 patients per hour to 1.5 patients per hour to 1.6 patients per hour by PGY-1 to -3 residents, respectively.[13] While these productivity numbers are higher than those in our study, the authors did not adjust for additional variables.

In a more comparable study, Kirby et al reported the efficiency of EM residents during ED crowding.[14] The authors used the National Emergency Department Overcrowding Study (NEDOCS) scoring system to categorize states in the ED as not crowded, crowded, and overcrowded. They found that resident productivity measured as new patients per hour increased initially in all year groups as the ED transitioned from not crowded to crowded, but then remained stable when transitioning from crowded to overcrowded. While the NEDOCS score uses a measure of ED boarding (the waiting time of the longest admitted patient), it does not include total patient boarding hours as in our study. Our study more directly examines the effect of boarding (one element of crowding) on resident productivity. The paradoxical increase in resident productivity in the Kirby study may have been due to an increased number of patients presenting to the ED, which could have increased the NEDOCS score. Our study demonstrated that resident productivity increased with higher patient volumes, and including this in our model allowed us to better isolate the effect of boarding.

According to a study by the Academy of Administrators in Academic Emergency Medicine and the Association of Academic Chairs of Emergency annual benchmark survey, boarding times have dramatically increased since the COVID-19 pandemic.[21] By the end of their study period, the median number of boarding hours per month was 11,480, which approximates to 382 hours of daily boarding. In our study, which includes a pre-pandemic period, the median daily boarding was 261 hours, suggesting that boarding is likely worsening over time and is a problem at many academic medical centers.

The educational impact of decreased patient volumes caused by boarding is uncertain. It is reasonable to expect that residents seeing fewer cases may lose valuable learning opportunities, but this has not been well studied and no firm numbers exist to suggest a threshold at which education suffers. Prior authors have surveyed residents regarding a perceived decrease in education during crowding.[22,23] These studies concluded that residents did not perceive a difference in education during these times, but they used differing measures of crowding, were survey-based, and underpowered. Educators may switch to different models of teaching during periods of high boarding, leading to residents perceiving a less deleterious effect.[24]

Others have postulated an educational Starling effect whereby some boarding allows supervising physicians more time to teach, but at some point there are diminished returns as fewer new patients become available to discuss.[25] A more recent study was conducted during the current boarding epidemic; the authors surveyed EM program directors regarding their perceptions of the impact of boarding on resident training.[26] In this study, 80% of the respondents felt that boarding negatively affected resident education, especially in the domains of managing department throughput and managing high volumes of patients per resident. While survey-based in nature, the study results broadly aligns with the prior studies in this area.

Theoretically, residents who see fewer cases may lose valuable learning opportunities. While the components of Bloom's domains of educational activities can be learned via different modalities of instructional techniques, clinical experience allows for the linking of knowledge to skills and then to attitudes/emotions.[27] By decreasing a learner's exposure to patients, one could argue that residents may lose valuable experiential learning opportunities. While some of these can be replicated in simulation or case-based discussion, other skills cannot and are best learned via hands-

on, experiential learning encounters. Experiential learning theory, as described by Kolb, highlights the importance of real-life experience and the influence this has on learning.[28] Unlike traditional learning and instructional methodology that focuses on rote memorization, experiential learning is an active process where residents are engaged in concept transformation through action as well as reflection on their experiences and patient encounters.

This learning theory also emphasizes principles of adult education in which prior learning experiences can be leveraged to create more meaningful and relevant educational experiences.[29] Additionally, decreasing patient interaction may also affect residents' application and translation of knowledge into practice. Behavioral learning theory emphasizes learning through interactions with the environment where reinforcement and feedback can encourage modification of behaviors. By incorporating behavioral learning strategies, medical education can foster not only technical competencies but also the development of professional habits such as effective communication between team members and patients.[30]

LIMITATIONS

This study has several limitations. This was a single-center study that took place in a high acuity, quaternary-care center that also experiences high levels of boarding, which may limit generalizability to other centers. The database that captured the resident patient assignment was based on tracking board data and may have occasionally miscredited a resident with a patient encounter; however, as the dataset was large and involved multiple years with complete datasets for three full classes of residents this is unlikely to have greatly influenced the data. Our resident class size did increase during the 2021 year and thus could theoretically have decreased the number of patients available per resident. While we did not study that directly, it is unlikely to have impacted the data greatly as the additional residents allowed for the creation of an outside rotation at a free-standing emergency center and, therefore, resident staffing hours stayed generally consistent at the study site.

Our model did not include a measure of patient acuity as a covariate. While the ESI category and disposition were recorded for each patient, we did not feel there was a reliable way to convert this data into a meaningful measure of hourly acuity that influenced the amount of time a resident might dedicate toward patient care. For example, an ESI-1 patient who is admitted for an ST-segment elevation myocardial infarction may stay in the department for 15 minutes leaving the bed open for a new patient, while an ESI-3 patient requiring a workup for abdominal pain including imaging who is discharged may occupy a room and a resident for multiple hours. Since our dataset was large, it was assumed that all residents would be exposed equally to the same mix of acuities on individual shifts, by the end of their residency and thus limit the effect on the data. Additionally, recent studies have called into question the accuracy of the ESI.[26,27] A prior study on resident productivity did not show a correlation between ESI and clinician disposition times.[14]

Our study also included data from the COVID-19 pandemic, which affected patient volumes and ED boarding. The dataset we used was initially meant for reporting individual residents' productivity measures, so data from the first few months of the pandemic was not available for our current study. This likely served to decrease the effect of the initial pandemic response on our data. Just prior to the pandemic our ED had seen a growth in patient volumes from 87,000 patients per year to a peak of 101,000 patients per year, which was followed by a rapid decline to 83,000 a year in the 2021–2022 year. The volumes did slowly rise after the study period. This may have influenced some of the data from our later resident-year groups and served to decrease productivity.

Our measure of boarding may also have limitations. Total boarding hours per day was the variable available from our hospital analytics department. The number of boarded patients per day may have provided different data. For example, in our model a single behavioral health patient boarding for 20 hours from one day would be indistinguishable from 20 patients boarding in 20 individual rooms for a single hour each. As the dataset is large, and all residents were exposed to the same conditions throughout their time, it is unlikely any one resident's data (or the trend) would be affected based on these types of outliers.

CONCLUSION

We found a significant reduction in resident productivity as measured by patients per hour during periods of increased boarding. Further studies are warranted to determine the educational impact of these findings.

Address for Correspondence: Peter Moffett, MD, Virginia Commonwealth University, Department of Emergency Medicine, 1250 E Marshall Street, Suite 600, Richmond VA 23298. Email: peter.moffett@vcuhealth.org

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Moffett et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. American College of Emergency Physicians. Emergency department boarding and crowding. Available at: https://www.acep.org/administration/crowding–boarding/. Accessed December 29, 2022.
2. Kelen GD, Wolfe R, D'Onofrio G, et al. Emergency department crowding: the canary in the health care system. *NEJM Catalyst Innovations in Care Delivery.* 2021. Available at: https://catalyst.nejm.org/doi/full/10.1056/CAT.21.0217. Accessed April 4, 2022.
3. Kulstad EB, Sikka R, Sweis RT, et al. ED overcrowding is associated with an increased frequency of medication errors. *Am J Emerg Med.* 2010;28(3):304–9.
4. Chatterjee P, Cucchiara BL, Lazarciuc N, et al. Emergency department crowding and time to care in patients with acute stroke. *Stroke.* 2011;42(4):1074–80.
5. Kulstad EB and Kelley KM. Overcrowding is associated with delays in percutaneous coronary intervention for acute myocardial infarction. *Int J Emerg Med.* 2009;2(3):149–54.
6. Fee C, Weber EJ, Maak CA, et al. Effect of emergency department crowding on time to antibiotics in patients admitted with community-acquired pneumonia. *Ann Emerg Med.* 2007;50(5):501–9, 509.e1.
7. Baloescu C, Kinsman J, Ravi S, et al. The cost of waiting: association of ED boarding with hospitalization costs. *Am J Emerg Med.* 2021;40:169–72.
8. Richardson DB. Increase in patient mortality at 10 days associated with emergency department overcrowding. *Med J Austral.* 2006;184(5):213–6.
9. McCarthy ML, Zeger SL, Ding R, et al. Crowding delays treatment and lengthens emergency department length of stay, even among high-acuity patients. *Ann Emerg Med.* 2009;54(4):492–503.e4.
10. White BA, Biddinger PD, Chang Y, et al. Boarding inpatients in the emergency department increases discharged patient length of stay. *J Emerg Med.* 2013;44(1):230–5.
11. Joseph JW, Henning DJ, Strouse CS, et al. Modeling hourly resident productivity in the emergency department. *Ann Emerg Med.* 2017;70(2):185–90.e6.
12. Jeanmonod R, Jeanmonod D, Ngiam R. Resident productivity: does shift length matter? *Am J Emerg Med.* 2008;26(7):789–91.
13. Turner-Lawrence D and Todd BR. Monthly progression of emergency medicine resident efficiency: what can we expect of our residents throughout training? *J Emerg Med.* 2019;57(1):77–81.
14. Kirby R, Robinson RD, Dib S, et al. Emergency medicine resident efficiency and emergency department crowding. *AEM Educ Train.* 2019;3(3):209–17.
15. Jeanmonod R, Brook C, Winther M, et al. Resident productivity as a function of emergency department volume, shift time of day, and cumulative time in the emergency department. *Am J Emerg Med.* 2009;27(3):313–9.
16. Joseph JW, Davis S, Wilker EH, et al. Modelling attending physician productivity in the emergency department: a multicentre study. *Emerg Med J.* 2018;35(5):317–22.
17. DeBehnke D, O'Brien S, Leschke R. Emergency medicine resident work productivity in an academic emergency department. *Acad Emerg Med.* 2000;7(1):90–2.
18. Fredette J, Kim T, McHugh D, et al. A descriptive analysis of emergency medicine resident productivity over the course of training. *AEM Education and Training.* 2021;5(S1):S44–8.
19. Jeanmonod R, Damewood S, Brook C. Resident productivity: trends over consecutive shifts. *Int J Emerg Med.* 2009;2(2):107–10.
20. Henning DJ, McGillicuddy DC, Sanchez LD. Evaluating the effect of emergency residency training on productivity in the emergency department. *J Emerg Med.* 2013;45(3):414–8.
21. Kilaru AS, Scheulen JJ, Harbertson CA, et al. Boarding in US academic emergency departments during the COVID-19 pandemic. *Ann Emerg Med.* 2023;82(3):247–54.
22. Mahler SA, McCartney JR, Swoboda TK, et al. The impact of emergency department overcrowding on resident education. *J Emerg Med.* 2012;42(1):69–73.
23. Pines JM, Prabhu A, McCusker CM, et al. The effect of ED crowding on education. *Am J Emerg Med.* 2010;28(2):217–20.
24. Atzema C, Bandiera G, Schull MJ, et al. Emergency department crowding: the effect on resident education. *Ann Emerg Med.* 2005;45(3):276–81.
25. Shayne P, Lin M, Ufberg JW, et al. The effect of emergency department crowding on education: blessing or curse? *Acad Emerg Med.* 2009;16(1):76–82.
26. Goldflam K, Bradby C, Coughlin RF, et al. Is boarding compromising our residents' education? A national survey of emergency medicine program directors. *AEM Educ Train.* 2024;8(2):e10973.
27. Bloom BS, Engelhart MD, Furst EJ, et al. *Taxonomy of Educational Objectives: Cognitive and Affective Domains*. New York, New York: David McKay Company, Inc, 1956.
28. Kolb DA. *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice-Hall; 1984.
29. Schultz K, McEwen L, Griffiths J. Applying Kolb's learning cycle to competency-based residency education. *Acad Med.* 2014;91(2):284.
30. Merriam S. *Adult Learning: Linking Theory and Practice*. San Francisco, CA: Jossey-Bass; 2013.
31. Sax DR, Warton EM, Mark DG, et al. Evaluation of the emergency severity index in US emergency departments for the rate of mistriage. *JAMA Netw Open.* 2023;6(3):e233404.
32. Mistry B, Stewart De Ramirez S, Kelen G, et al. Accuracy and reliability of emergency department triage using the emergency severity index: an international multicenter assessment. *Ann Emerg Med.* 2018;71(5):581–7.e3.

Leadership Perceptions, Educational Struggles and Barriers, and Effective Modalities for Teaching Vertigo and the HINTS Exam: A National Survey of Emergency Medicine Residency Program Directors

Mary McLean, MD[*]
Justin Stowens, MD[†]
Ryan Barnicle, MD, MSEd[‡]
Negar Mafi, MD[§]
Kaushal Shah, MD[‖]

[*]AdventHealth East Orlando, Department of Emergency Medicine, Orlando, Florida
[†]ChristianaCare Health System, Department of Emergency Medicine, Newark, Delaware
[‡]The Warren Alpert Medical School of Brown University, Department of Emergency Medicine, Providence, Rhode Island
[§]San Joaquin General Hospital, Department of Emergency Medicine, French Camp, California
[‖]Weill Cornell Medicine, Department of Emergency Medicine, New York, New York

Section Editors: Jules Jung, MD and Sharon Bord, MD
Submission history: Submitted April 11, 2024; Revision received November 18, 2024; Accepted November 19, 2024
Electronically published December 31, 2024
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.20787

Introduction: The utility of the three-part bedside oculomotor exam HINTS (head impulse test, nystagmus, test of skew) in the hands of emergency physicians remains under debate despite being supported by the most recent literature. Educators historically lack consensus on how specifically to teach this skill to emergency medicine (EM) residents, and it is unknown whether and how EM residency programs have begun to implement HINTS training into their curricula. We aimed to characterize the state of HINTS education in EM residency and develop a needs assessment.

Methods: In this cross-sectional study, we administered a survey to EM residency directors, the themes of which centered around HINTS education perceptions, practices, resources, and needs. We analyzed Likert scales with means and 95% confidence intervals for normally distributed data, and with medians and interquartile ranges for non-normally distributed data. Frequency distributions, means, and standard deviations were used in all other analyses.

Results: Of 250 eligible participants, 201 (80.4%) responded and consented. Of the 192 respondents providing usable data, 149/191 (78.0%) believed the HINTS exam is valuable to teach; 124/192 (64.6%) reported HINTS educational offerings in conference; and 148/192 (77.1%) reported clinical bedside teaching by faculty. The most-effective educational modalities were clinical bedside teaching, online videos, and simulation. Subtopic teaching struggles with regard to HINTS were head impulse test and test-of-skew conduction and interpretation, selection of the correct patients, and overall HINTS interpretation. Teaching barriers centered around lack of faculty expertise, concern for poor HINTS reproducibility, and lack of resources. Leadership would dedicate a mean of 2.0 hours/year (SD 1.3 hours/year) to implementing a formal, standardized HINTS curriculum.

Conclusion: Despite controversy surrounding the utility of the HINTS exam in EM, most residency directors believe it is important to teach. This needs assessment can guide development of formal educational and simulation curricula focusing on residency directors' cited HINTS exam educational struggles, barriers, and reported most-effective teaching modalities. [West J Emerg Med. 2025;26(1)70–77.]

INTRODUCTION

Background

Posterior stroke presenting with dizziness is misdiagnosed by emergency physicians (EP) in 35% of cases,[1] which can lead to severe debilitation and sometimes death.[2] Paradoxically, of patients discharged from the emergency department (ED) with a diagnosis of dizziness or vertigo, only 1 in 500 is diagnosed with a stroke within the first month.[3] With advances in stroke treatment modalities, it makes sense that there is heightened emphasis on detection. In 2013, the annual cost of imaging for acute dizziness in United States EDs was nearly $4 billion.[4] Much of this cost is due to utilization of non-contrast computed tomography (CT) of the head[5] despite its low sensitivity for detecting posterior fossa stroke (mean 41.8%, 95% confidence interval 30.1–54.4%)[6] and the low lifetime cost-effectiveness compared to magnetic resonance imaging (MRI).[7] Specifically, it is estimated that over $1 billion per year is wasted on inappropriate CT imaging for patients with dizziness/vertigo.[8]

A worldwide survey of EPs published in 2008 found that the development of a better clinical decision rule for identification of central vertigo was the second highest clinical priority for participants.[9] Management of dizziness and vertigo is included in the Joint Task Force Emergency Medicine Model of Clinical Practice,[10] and EPs are expected to diagnose and manage patients with these chief complaints. It is, therefore, incumbent upon EM residency programs to provide adequate education and training on dizziness and vertigo. However, a 2005 study found that only 35% of EM residency programs required a clinical neurology or neurosurgery rotation, and an annual mean of 12 hours (of 280 total didactic education hours) was dedicated to neurologic emergencies.[11] It is unknown how much of this time is devoted specifically to dizziness and vertigo, or exactly what is being taught regarding appropriate history, physical, and diagnostic workup recommendations.

The clinical HINTS exam (head impulse test, nystagmus, test of skew)[12] is a three-part bedside oculomotor exam with diagnostic accuracy for central vertigo similar to that of MRI. A 2023 Cochrane Review of 12 studies and 1,890 participants found the clinical HINTS exam to be 94% sensitive and 87% specific.[13] This exam may be appealing to the EP because it is purported to be a rapid and low-cost bedside evaluation. However, literature suggests that its diagnostic accuracy has fallen short for EPs using the HINTS exam in clinical practice, with findings suggesting that the reasons are application to inappropriate patients (eg, those without acute vestibular syndrome and nystagmus) and difficulty in interpreting head impulse test (HIT) results.[14,15] In addition, the literature has shown poor inter-rater reliability among EPs using the HINTS exam.[16] With these concerns in mind, two other clinical decision tools have since built on HINTS principles. The first is the HINTS "plus" tool, which adds a hearing test (95.3% sensitive and 72.9% specific).[13] The second is the STANDING (spontaneous nystagmus, direction, head impulse test) algorithm, which uses two parts of the HINTS exam and additional physical exam maneuvers (93–100% sensitive and 72–94% specific).[17–19]

The 2023 American College of Emergency Physicians (ACEP) Clinical Practice Guideline offers specific HINTS exam recommendations and cautions: "Before employing a maneuver such as HINTS, physicians should have sufficient education to perform the technique; not using tools such as HINTS may lead to excessive testing and admission; and incorrect implementation may lead to an increased risk of misdiagnosis."[20] In addition to ACEP's recommendations, in 2023,the Society for Academic Emergency Medicine released Guidelines for Reasonable and Appropriate Care in the Emergency Department (GRACE-3): Acute Dizziness and Vertigo in the Emergency Department. They had similar recommendations that EP education should involve the following : "receive training in the HINTS exam; use the HINTS exam (once properly trained) in patients with nystagmus; and consider the HINTS exam as the first-line test over MRI (if a HINTS-trained clinician is available)."[21,22] The authors of GRACE-3 also acknowledged a discordance in that most EPs have not received special training in the use of the HINTS exam. This

Population Health Research Capsule

What do we already know about this issue?
When properly used, the HINTS exam has high diagnostic accuracy for central causes in dizzy patients, but the state of HINTS education in (EM) is inadequately characterized.

What was the research question?
What are program leadership perceptions, educational practices, and barriers to teaching HINTS in EM residencies?

What was the major finding of the study?
78.0% of program leaders believe the 3-part oculomotor exam is valuable to teach, and 64.6% offer formal HINTS education sessions.

How does this improve population health?
Teaching HINTS to EM residents requires improved curricula, resources, and faculty expertise. Better education may help translate promising HINTS literature into clinical practice.

lack of special training may have led to the HINTS testing inaccuracies reported in the recent literature.[14,15] This begs the question of which, if any, educational tactics have been effective.

From the recent GRACE-3 guidelines[21] and releases by EM societies,[10,20] there is a clear call for EM HINTS education and HINTS exam integration into the EM clinical arena. However, the current state of HINTS exam acceptance, education, and training is unclear. If HINTS curricular implementation has occurred, information about the needs, barriers, teaching struggles, and educator perspectives may add further weight to the argument for our specialty's overall acceptance of the HINTS exam.

Importance

The standard of care for the ED evaluation of dizzy patients may be evolving to embrace the HINTS exam, but translation of the literature to clinical practice remains unclear. It is also unclear what proportion of EPs have been adequately trained in the use of the HINTS exam. Furthermore, residency programs may lack the faculty expertise, time and funding to add new items such as HINTS education to their curricula. Programs that have adopted the societal guidelines addressing the HINTS exam may have already adjusted their didactic and simulation content. Supporters of the HINTS exam will recognize the importance of a needs assessment with regard to residency efforts and perceived challenges and barriers to dizziness evaluation and HINTS education. Skeptics will find the knowledge of current HINTS teaching paradigms useful to determine their own practice and the potentially evolving standard of care.

Goals of This Investigation

While recent research supports a need for change in our ED clinical practice, it has yet to be assessed whether these ideas are currently being taught within EM residency programs, and if so, how they are being taught. Our goal in this investigation was to assess the current United States EM residency program leadership perspectives, teaching paradigms, teaching barriers, and future needs for implementing educational curricula on assessment of the dizzy patient, with a particular focus on the HINTS exam. The results of this educational needs assessment can serve to guide and refine the construction of educational resources including didactic and simulation modalities.

METHODS

Study Design and Setting

This was a cross-sectional observational study in a virtual setting. Participants were offered no incentives, there was no funding, and the study was institutional review board-approved as exempt. An electronic survey was administered to EM residency directors between April 6–July 13, 2023. The study was conducted in compliance with STROBE (Strengthening the Reporting of Observational studies in Epidemiology) cross-sectional reporting guidelines.[23]

Selection of Participants

Included were current program directors for categorical EM residency programs in the US. Excluded were program directors from residency programs that received initial accreditation from the Accreditation Council for Graduate Medical Education on or after January 1, 2020. The rationale for this exclusion was that new programs were less likely to have administered an entire educational curriculum cycle. The target population included 250 program leaders (one from each eligible program). Program director contact information was obtained from medical society databases and residency program websites. While both work and personal emails were often publicly available, we prioritized making contact via work emails. See Appendix A for the participant recruitment message.

Survey Development

The survey instrument was developed, tested, and validated using a rigorous process with close guidance and leadership from seasoned national medical education experts via a formal Medical Education Research Certification program through the Council of Residency Directors in Emergency Medicine. We followed the systematic, seven-step protocol for developing medical education research questionnaires described by Artino et al.[24] Formal focus groups were used to propose, discuss, and rework survey items using an iterative process until consensus was reached regarding face validity and internal consistency. The survey was piloted by a group of 20 members of the nonprofit medical education alliance ALL NYC EM (consisting of EP medical educators, residency leadership members, and resident education fellows) for feedback on clarity and usability. The sole consensus recommendation was to shorten the survey, which was done prior to national distribution. Final survey items included program/institution demographics and questions about perceptions and practices regarding dizziness, vertigo, and HINTS exam education within each residency program. See Appendix B for a copy of the complete survey tool.

Study Protocol

We used the electronic platform SurveyMonkey (SurveyMonkey Enterprise, San Mateo, CA) to distribute the survey and collect data. The 250 program directors were initially contacted individually via email with the recruitment message and their personalized survey link. Subsequent contact attempts (required for 235 program directors) were made for non-responses or incomplete surveys. At the end of the data collection period, all complete and partial surveys were included in analysis if the participant provided data

beyond the informed consent question. Except for the informed consent question, no survey question was required. This allowed participants to opt out of answering specific questions if they wished while still enabling them to participate. Missing data from participants who opted out of a question was not included in the calculations for subsequent statistical analysis for that item.

Outcomes

Intended outcomes centered around residency directors' HINTS exam perceptions as well as current HINTS educational practices within residency programs, resources available, and curricular needs. The purpose of gathering information on these outcomes was to generate a needs assessment for dizziness and HINTS exam curricula in EM residencies.

Analysis

We analyzed data using R version 4.3.2 for MacOS (R Foundation for Statistical Computing, Vienna, Austria). Likert-scale data was analyzed using medians and interquartile ranges for non-normal data distributions or using means and 95% confidence intervals (CI) for normal data distributions. We tested normality of data distributions by examining estimates of skewness and kurtosis for each scale, as well as by plotting histograms and comparing distributions to the normal curve. Normality was concluded only if all estimates of skewness and kurtosis fell below the thresholds of 2 and 7, respectively, and all histograms aligned closely with the normal curve.[25] We used the Wilson score statistic for calculation of 95% CIs for binomial proportion items (yes/no items with an answer of "yes" defined as a positive result).[26,27] Frequency distributions were used to analyze questions about struggles and barriers to teaching the HINTS exam. We used descriptive statistics (means and standard deviations for all other quantitative data. As participants were permitted to skip any question, missing data was omitted from item-level analyses. See Appendix C for details on missing data and item-level response rates.

RESULTS

Characteristics of Study Subjects

Of 250 eligible programs, leadership from 204 opened the survey and 201 provided informed consent for an overall survey response rate of 80.4%. Among consenting respondents, 192 programs provided useful data beyond the initial informed consent question. See Appendix D for the enrollment flowsheet. Participating program demographic characteristics were well representative of the population of all eligible programs (see Appendix E).

Main Results

Overall, 149/191 (78.0%) believed the HINTS exam is valuable to teach, 16/191 (8.4%) believed it is not, and 25/191 (13.1%) were unsure. On subgroup analyses of these and other key survey items, program demographic factors (program length, setting, type, and region) were of no statistical significance after controlling for multiple comparisons. The most effective educational modalities for teaching the HINTS exam were reported to be clinical bedside teaching, videocasts/online videos, and simulation. Perceptions of modality effectiveness varied widely. See Figure 1.

Program leadership reported perceptions that their residency graduates were, on average, more confident and competent than their faculty members at performance and interpretation of the HINTS exam. They also reported perceptions that, for both residency graduates and faculty members, confidence was higher than competence. However, none of these patterns reached statistical significance. See Appendix F.

The most frequently cited HINTS subtopic teaching struggles centered around the HIT, test of skew, HINTS application to correct patients, and overall HINTS interpretation. See Figure 2. The most frequently cited HINTS teaching barriers centered around lack of faculty expertise, concern for poor HINTS exam reproducibility, and lack of resources. See Figure 3. Lastly, program leadership indicated that they would dedicate a mean of 2.0 hours/year (SD 1.3 hours/year) to implementing a formal, standardized HINTS exam curriculum if such a curriculum were widely available.

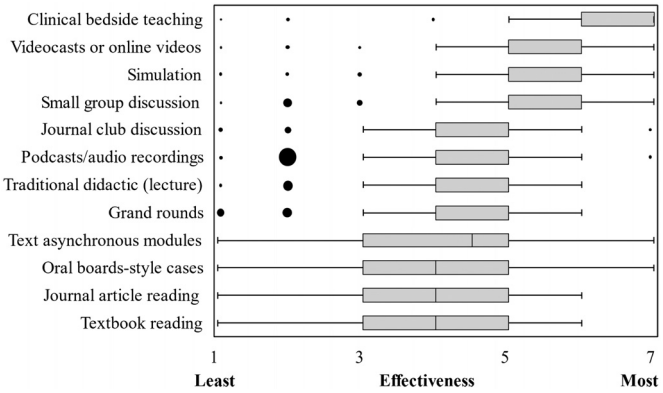


Figure 1. Box-and-whisker plot of leadership-perceived educational modality effectiveness for teaching the HINTS* examination: 188 participants provided usable data on this item (item-level response rate 75.2%). Likert-scale ratings from least (1) to most (7) effective were used. Data for one of the 12 modalities (clinical bedside teaching) was not normally distributed and thus medians and interquartile ranges (IQR) were used for all analyses. Medians are represented by thick vertical lines, IQRs are represented by gray boxes, whiskers represent 1.5* IQR, and outlier data is represented by black dots, with the area of each dot proportional to the answer frequency.
*HINTS**, head impulse test, nystagmus, test of skew.

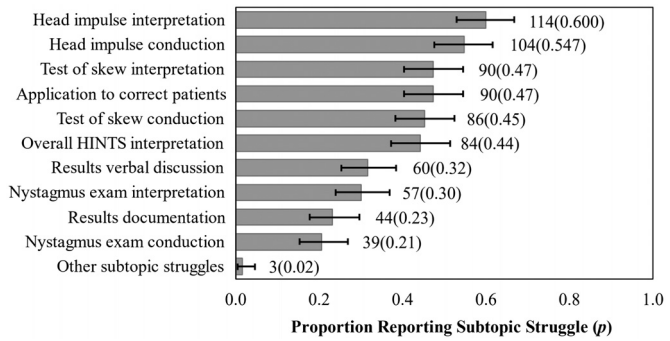


Figure 2. Frequency of residency program director-reported HINTS exam subtopic teaching struggles: 190 participants provided useable data on this item (item-level response rate 76.0%). Error bars represent the 95% confidence interval for these binomial proportion items using the Wilson statistic.

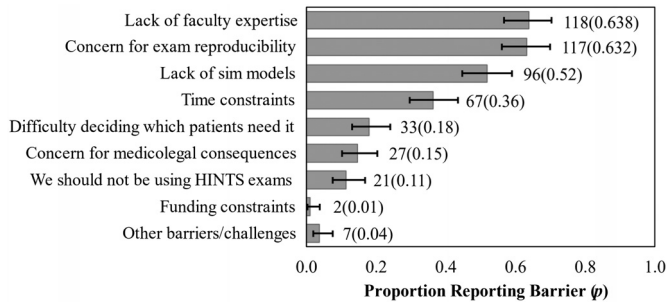


Figure 3. Frequency of residency program director-reported barriers to teaching the HINTS* examination. 185 participants provided useable data on this item (item-level response rate 74.0%). Error bars represent the 95% confidence interval for these binomial proportion items using the Wilson statistic.
**HINTS*, head impulse test, nystagmus, test of skew.

DISCUSSION

Our findings may reflect underlying causes for the difficulties EPs have teaching and using the HINTS exam. Faculty members may hesitate to teach it if they exhibit discomfort with their own HINTS exam skills. In our findings, program leadership expressed lack of faculty expertise as an educational barrier, and they also perceived their residency graduates to be more competent with this skill than their faculty members (although this finding did not reach statistical significance). Additionally, program directors' cited barrier of concern for poor HINTS exam reproducibility may point toward physicians' innate desire for diagnostic certainty and the perception that the HINTS exam is fallible. Our respondents reported that HINTS is valuable to teach, but they less often reported HINTS offerings in conferences. The cited reasons for this discordance centered around lack of time, resources, and faculty expertise.

It has been shown in the original HINTS literature and subsequent research released from neurology and EM collaboration efforts that it is possible to effectively learn this skill,[13,21] yet our results do not describe widespread skill acquisition among EPs. It is possible that educational collaboration between the specialties could positively impact EPs' proficiency in the exam itself and in optimal educational methods. Regardless, our survey results support a desire to address the lack of faculty expertise. Much collaboration is already occurring, as evidenced by recent dizziness and vertigo literature authored by teams including members of both specialties,[21,28–30] as well as research with mixed cohorts from both specialties.[1]

Our results show that simulation was perceived as one of the most effective modalities for HINTS education, but lack of simulation models was also cited as a top educational barrier. The HINTS education literature from neurology and neuro-subspecialties has proposed some innovative simulation adjuncts. For example, one study found that neurology trainees' utilization of video-oculography (VOG) technology in simulation correlated with significant improvements in HIT performance.[31] Two studies used virtual reality-enhanced manikin task trainers for HINTS simulation, demonstrating exam sensitivity and specificity improvements, including among EP cohorts.[32,33] While such "partial task trainers" may have utility, our survey suggests they are not widely used or commercially available. The VOG devices are commercially available and have quality assurance (QA) features to assist examiners' HIT performance via feedback on maneuver angles and velocities. A recent study used these QA features in EM resident HIT simulation and reported significant improvement in HIT maneuver performance.[34]

There are no published parameters from the neurology or subspecialty literature regarding the optimal HINTS curriculum training durations. However, a 2022 systematic review of HINTS and STANDING education reported on five institutions' EM educational practices. They found wide curricular variability in didactic time (1–5 hours), workshop time (1–8 hours), neurology exposure (clinical rotations), and proctored exams (up to 15) over each resident's duration in the program.[35] Our participants indicated they would dedicate a mean of 2.0 hours/year to HINTS education, and over the course of a three- or four-year residency, this would be adequate time for the parameters described.[35] Despite willingness to commit this time, other literature suggests that the exam application and maneuvers may be more complex than our specialty recognizes.[14] As reflected in our results, program leadership perceived higher confidence than competence among graduates and faculty alike (although this did not reach statistical significance). This phenomenon—the Dunning-Kruger effect—is present in medicine, and existing literature suggests that assessments by examiners from multiple disciplines are required to ensure proficiency in such high-level skills.[36,37] This would potentially add more time to a HINTS curriculum.

Our results contribute to a growing description of the HINTS educational modalities in use, but each modality has

pros and cons beyond the training hours required. Clinical bedside teaching (the highest-rated modality in our survey) provides the highest-fidelity and real-life experience but is dependent on case convenience (dizzy/vertiginous patients presenting) and educator availability on shift. The opportunity cost of bedside training must be considered as well. The survey does not explore the hypothetical on-shift faculty time spent and associated opportunity cost, which would be a useful topic for future research.

Simulation tied for second place as the highest-rated HINTS educational modality. It mitigates the case convenience issue by providing on-demand patient cases in a controlled setting, but it also presents a faculty opportunity/cost issue by increasing training time in the simulation center. Hands-on skill simulation requires small-group or individual instruction, which uses more faculty time and the use of simulation models, and possibly other simulation adjuncts. Our survey did not ask about specific HINTS simulation equipment or techniques being used at EM residency programs in the US, but even if aggressive cost-of-implementation estimates are made, the return on investment would make HINTS educational initiatives financially worthwhile. The nationwide capital expenditures (specifically, VOG devices for simulation) cost about $9.76 million, which amounts to 1% of the estimated $1 billion/year spent on inappropriate CT imaging for patients with dizziness/vertigo in the US.[8] The estimated national yearly cost after capital investment (specifically, the cost of faculty time) is about $331,883 in addition to costs for any equipment repair or new devices/adjuncts. See Appendix G for the cost-of-implementation analysis.[34,38–41]

Notably, HINTS manikin "partial task trainers" have been developed and tested, but none are widely available.[32,33] The 2023 ACEP Clinical Policy recommended incorporation of technology such as Frenzel goggles and ocular tracking software in training.[20] The VOG devices are commercially available for $12,000–40,000 per device and have shown promise in the simulation environment.[31,34,38,42]

To describe the effectiveness of many educational options (including those amenable to asynchronous and large-group sessions), we asked about several other modalities in addition to clinical bedside teaching and HINTS simulation. Online videos and videocasts were tied with simulation for the second highest-rated teaching modality among participants. Contrary to bedside and simulation teaching, this modality requires no faculty time or supervision and is free. Online HINTS educational videos can be used as an asynchronous supplement to clinical bedside teaching and simulation, but watching videos is a passive learning technique with no hands-on practice or opportunity for acquisition of muscle memory. However, recent studies suggest that achieving HINTS exam skills (particularly HIT skills) does require a hands-on component for motor skills acquisition.[34]

Overall, more time, effort, funding, and educational research could be targeted toward creating HINTS curricula and simulation modalities, and on making these resources widely available to improve EM residency HINTS educational options. The variability in our survey results shows that multiple education modalities are likely being employed across the residency training programs in the US but with some consensus about the most useful modalities. In such a situation where multiple modalities are being employed to the same end, further research toward development of a standardized training plan is needed.

LIMITATIONS

To achieve adequate response rates from our survey, the length of the survey was limited at the recommendations of the expert pilot test group. Additionally, variability of the question design was employed to hold participants' interest and increase response rates. As a result, some questions were asked in a binary "yes/no" format instead of Likert scales or rankings, potentially sacrificing some depth of response interpretation. Another concern with our survey design was response bias. While allowing questions on the survey to be left unanswered supports overall increased response rates, bias may have been introduced via respondent-allocated missing data. It is possible that program leaders who answered fewer questions had more passive opinions about the HINTS exam, exhibiting neutral response bias wherein, for example, they selected "neutral" or "no opinion" on classic Likert-scale questions. The opposite is also possible wherein the survey results are biased toward those in strongly in favor of or strongly against the HINTS exam (extreme response bias). Fortunately, our overall high response rates and wide variability of responses suggests these limitations are minimal.

Surveys were initially sent to EM residency program directors who had the option of either completing it themselves or assigning the responsibility to an associate program director, or to the faculty leader of the residency's curricular content. There is, thus, a possibility that answers varied depending on the role of the survey-taker for each program, which was not recorded.

CONCLUSION

Emergency medicine residency programs and medical educators should focus their HINTS educational priorities on development of a formalized curriculum with adequate resources. Programs will also need to address the barrier of lack of faculty expertise.

Address for Correspondence: Mary McLean, MD, AdventHealth East Orlando, Department of Emergency Medicine, 7727 Lake Underhill Rd., Orlando, FL 32822. Email: Mary.McLean.MD@AdventHealth.com

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 McLean et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Kerber KA, Brown DL, Lisabeth LD, et al. Stroke among patients with dizziness, vertigo, and imbalance in the emergency department: a population-based study. *Stroke.* 2006;37(10):2484–7.
2. Savitz SI, Caplan LR, Edlow JA. Pitfalls in the diagnosis of cerebellar infarction. *Acad Emerg Med.* 2007;14(1):63–8.
3. Kim AS, Fullerton HJ, Johnston SC. Risk of vascular events in emergency department patients discharged home with diagnosis of dizziness or vertigo. *Ann Emerg Med.* 2011;57(1):34–41.
4. Ahsan SF, Syamal MN, Yaremchuk K, et al. The costs and utility of imaging in evaluating dizzy patients in the emergency room. *Laryngoscope.* 2013;123(9):2250–3.
5. Saber Tehrani AS, Coughlan D, Hsieh YH, et al. Rising annual costs of dizziness presentations to U.S. emergency departments. *Acad Emerg Med.* 2013;20(7):689–96.
6. Hwang DY, Silva GS, Furie KL, et al. Comparative sensitivity of computed tomography vs. magnetic resonance imaging for detecting acute posterior fossa infarct. *J Emerg Med.* 2012;42(5):559–65.
7. Tu LH, Melnick E, Venkatesh AK, et al. Cost-effectiveness of CT, CTA, MRI, and specialized MRI for evaluation of patients presenting to the emergency department with dizziness. *AJR Am J Roentgenol.* 2024;222(2):e2330060.
8. Keita M, Nassery N, Sebestyen K, et al. Diagnostic errors, harms, and waste in evaluating dizziness and vertigo in ambulatory care settings across the United States [abstract]. Diagnostic Error in Medicine 11th International Conference. November 4–6, 2018; New Orleans, Louisiana.
9. Eagles D, Stiell IG, Clement CM, et al. International survey of emergency physicians' priorities for clinical decision rules. *Acad Emerg Med.* 2008;15(2):177–82.
10. Beeson MS, Ankel F, Bhat R, et al. The 2019 model of the clinical practice of emergency medicine. *J Emerg Med.* 2020;59(1):96–120.
11. Stettler BA, Jauch EC, Kissela B, et al. Neurologic education in emergency medicine training programs. *Acad Emerg Med.* 2005;12(9):909–11.
12. Kattah JC, Talkad AV, Wang DZ, et al. HINTS to diagnose stroke in the acute vestibular syndrome: three-step bedside oculomotor examination more sensitive than early MRI diffusion-weighted imaging. *Stroke.* 2009;40(11):3504–10.
13. Gottlieb M, Peksa GD, Carlson JN. Head impulse, nystagmus, and test of skew examination for diagnosing central causes of acute vestibular syndrome. *Cochrane Database Syst Rev.* 2023;(11):CD015089.
14. Dmitriew C, Regis A, Bodunde O, et al. Diagnostic accuracy of the HINTS exam in an emergency department: a retrospective chart review. *Acad Emerg Med.* 2021;28(4):387–93.
15. Ohle R, Montpellier RA, Marchadier V, et al. Can emergency physicians accurately rule out a central cause of vertigo using the HINTS examination? A systematic review and meta-analysis. *Acad Emerg Med.* 2020;27(9):887–96.
16. Henriksen AC and Hallas P. Inter-rater variability in the interpretation of the head impulse test results. *Clin Exp Emerg Med.* 2018;5(1):69–70.
17. Gerlier C, Hoarau M, Fels A, et al. Differentiating central from peripheral causes of acute vertigo in an emergency setting with the HINTS, STANDING, and ABCD2 tests: a diagnostic cohort study. *Acad Emerg Med.* 2021;28(12):1368–78.
18. Vanni S, Pecci R, Edlow JA, et al. Differential diagnosis of vertigo in the emergency department: a prospective validation study of the STANDING algorithm. *Front Neurol.* 2017;8:590.
19. Vanni S, Nazerian P, Pecci R, et al. Timing for nystagmus evaluation by STANDING or HINTS in patients with vertigo/dizziness in the emergency department. *Acad Emerg Med.* 2023;30(5):592–4.
20. American College of Emergency Physicians Clinical Policies Subcommittee (Writing Committee) on Acute Ischemic Stroke. Lo BM, Carpenter CR, et al. Clinical policy: critical issues in the management of adult patients presenting to the emergency department with acute ischemic stroke. *Ann Emerg Med.* 2023;82(2):e17–64.
21. Edlow JA, Carpenter C, Akhter M, et al. Guidelines for reasonable and appropriate care in the emergency department 3 (GRACE-3): acute dizziness and vertigo in the emergency department. *Acad Emerg Med.* 2023;30(5):442–86.
22. Shah VP, Oliveira JE Silva L, Farah W, et al. Diagnostic accuracy of the physical examination in emergency department patients with acute vertigo or dizziness: a systematic review and meta-analysis for GRACE-3. *Acad Emerg Med.* 2023;30(5):552–78.
23. von Elm E, Altman DG, Egger M, et al. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *PLoS Med.* 2007;4(10):e296.
24. Artino AR Jr, La Rochelle JS, Dezee KJ, et al. Developing questionnaires for educational research: AMEE guide no. 87. *Med Teach.* 2014;36(6):463–74.
25. Fidell LS and Tabachnick BG. Preparatory data analysis. In: Schinka JA & Velicer WF (Eds.) *Handbook of Psychology: Research Methods in Psychology (115–141)*, Vol. 2. Hoboken, NJ: John Wiley & Sons, Inc, 2003.
26. Agresti A and Coull BA. Approximate is better than "exact" for interval estimation of binomial proportions. *Am Stat.* 1998;52(2):119–26.
27. Brown LD and Cai TT, DasGupta A. Interval estimation for a binomial proportion. *Stat Sci.* 2001;16(2):101–17.
28. Edlow JA, Gurley KL, Newman-Toker DE. A new diagnostic approach to the adult patient with acute dizziness. *J Emerg Med.* 2018;54(4):469–83.

29. Newman-Toker DE, Peterson SM, Badihian S, et al. (2022). *Diagnostic errors in the emergency department: a systematic review.* Rockville, MD: Agency for Healthcare Research and Quality (US).
30. Puissant MM, Giampalmo S, Wira CR III, et al. Approach to acute dizziness/vertigo in the emergency department: selected controversies regarding specialty consultation. *Stroke.* 2024;55(10):2584–8.
31. Korda A, Sauter TC, Caversaccio MD, et al. Quantifying a learning curve for video head impulse test: pitfalls and pearls. *Front Neurol.* 2021;11:615651.
32. Charlery-Adèle A, Guigou C, Ryard J, et al. Effects of saccade delay, side of deficit, and training on detection of catch-up saccades during head-impulse test in virtual-reality-enhanced mannequin. *Sci Rep.* 2023;13(1):2718.
33. Ursat G, Corda M, Ryard J, et al. Virtual-reality-enhanced mannequin to train emergency physicians to examine dizzy patients using the HINTS method. *Front Neurol.* 2024;14:1335121.
34. Lenning JC, Messman AM, Kline JA. Application of motor learning theory to teach the head impulse test to emergency medicine resident physicians. *AEM Educ Train.* 2024;8(1):e10936.
35. Nakatsuka M and Molloy EE. The HINTS examination and STANDING algorithm in acute vestibular syndrome: a systematic review and meta-analysis involving frontline point-of-care emergency physicians. *PLoS One.* 2022;17(5):e0266252.
36. Kruger J and Dunning D. Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments. *J Pers Soc Psychol.* 1999;77(6):1121–34.
37. Barnsley L, Lyon PM, Ralston SJ, et al. Clinical skills in junior medical officers: a comparison of self-reported confidence and observed competence. *Med Educ.* 2004;38(4):358–67.
38. Bastani PB, Badihian S, Phillips V, et al. Smartphones versus goggles for video-oculography: current status and future direction. *Res Vestib Sci.* 2024;23(3):63–70.
39. Koval ML. Medscape emergency medicine physician compensation report 2024: bigger checks, yet many doctors still see an underpaid profession. 2024. Available at: https://www.medscape.com/slideshow/2024-compensation-emergency-medicine-6017136. Accessed October 1, 2024.
40. Association of American Medical Colleges. Report on residents. 2023. Available at: https://www.aamc.org/data-reports/students-residents/report/report-residents. Accessed October 1, 2024.
41. Lenio R. Emergency medicine annual worked hours: market norms vary widely. 2023. Available at: https://www.ajg.com/us/news-and-insights/2023/mar/emergency-medicine-annual-worked-hours-market-norms-vary-widely/. Accessed October 1, 2024.
42. Newman-Toker DE, Saber Tehrani AS, Mantokoudis G, et al. Quantitative video-oculography to help diagnose stroke in acute vertigo and dizziness: toward an ECG for the eyes. *Stroke.* 2013;44(4):1158–61.

Push and Pull: What Factors Attracted Applicants to Emergency Medicine and What Factors Pushed Them Away Following the 2023 Match

Michael Kiemeney, MD* *Loma Linda University School of Medicine, Loma Linda, California
James Morris, MD, MPH† †Texas Tech University Health Sciences Center, Lubbock, Texas
Lauren Lamparter, MD‡ ‡University of Illinois Chicago, Chicago, Illinois
Moshe Weizberg, MD§ §Staten Island University, Staten Island, New York
Andy Little, DO‖ ‖AdventHealth East Orlando, Orlando, Florida
Brian Milman, MD¶ ¶University of Texas Southwestern Medical Center, Dallas, Texas

Section Editors: Matthew Tews, MD, Andrew Ketterer, MD, and Andrew Golden, MD
Submission history: Submitted May 24, 2024; Revision received November 8, 2024; Accepted November 25, 2024
Electronically published February 14, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.21249

Introduction: Emergency medicine (EM) historically enjoyed a nearly 100% match rate. A rapid change saw 46% of EM programs with one or more unfilled positions after the 2023 Match. Much has been discussed about potential causes, and characteristics of unfilled programs have been investigated. We surveyed recent applicants to EM to further understand what continues to draw them to EM and what concerns deter them from choosing a career in EM.

Methods: A cross-sectional, mixed methods survey was distributed in the summer of 2023 to a convenience sample of respondents via the listservs of national EM resident and student organizations as well as clerkship directors in EM. We did not calculate response rate due to listserv convenience sampling. A total of 213 responses were received, representing 7.7% of the total number of EM applicants (2,765) in 2023. Applicants were asked to rank from 1 to 5 their experiences with EM and the characteristics of the specialty that were important in their career decision. We calculated means and 95% confidence intervals for quantitative results. We performed qualitative analysis of free-text responses to identify themes.

Results: Positive factors for applicants were interactions with EM faculty (4.29 on 1–5 scale) and residents (4.42) as well as clinical experiences in third-year (4.53) and fourth-year clerkships (4.62). Applicants continue to be drawn to EM by the variety of pathology encountered (4.66), flexible lifestyle (4.63), and high-acuity patient care (4.43). Most applicants (68.5%) experienced advisement away from EM. Of those who received negative advisement, non-emergency physicians were the most common source (73.3%). Factors negatively influencing a career choice in EM were corporate influence (2.51), ED crowding (2.52), burnout (2.59), presence of advanced practice practitioners (APP) in EM (2.63), and workforce concerns (2.85). Job concerns stemming from the 2021 EM workforce report were identified by respondents as the primary reason for recent Match results.

Conclusion: Applicants noted clinical experiences in the emergency department and interactions with EM attendings and residents as positive experiences. High-acuity patient care, variety of pathology, and flexible lifestyle continue to attract applicants. Applicants identified EM workforce concerns as the primary contributor to recent EM Match results. Corporate influence, ED crowding, burnout, and presence of APPs in the ED were also significant issues. [West J Emerg Med. 2025;26(2)261–270.]

INTRODUCTION

Emergency medicine (EM) has historically enjoyed a very competitive outcome in the National Residency Matching Program (NRMP, or "the Match") with >95% of programs filling their spots.[1] Beginning in 2022, however, a dramatic decline occurred leaving many programs unfilled.[2] This decline continued in 2023, with 46% of EM programs remaining unfilled.[3] Although 79.1% of those programs filled in the Supplemental Offer and Acceptance Program (SOAP),[4] this represents a tremendous change from previous years.

The cause of this change is likely multifactorial, with major contributing factors being the expansion of the number of residency positions, student perceptions of the future job market within EM, and the virtual interview format.[5,6] Other proposed etiologies of the decline include the corporate practice of EM (which occurs when a non-physician or corporation exerts control over the medical decision-making or collects reimbursement for the medical services of physicians),[7] the expanded use of advanced practice practitioners (APP) such as physician assistants and nurse practitioners in the emergency department (ED), and increased burnout following a global pandemic.[6] Concerns regarding the job market and expanded use of APPs are likely related to the 2021 EM workforce report by Marco et al, which proposed a range of potential outlooks based on various factors with the most publicized result being a projected oversupply of emergency physicians by 2030.[8]

Several factors affected which programs were more likely to go unfilled in the Match. Gettel et al found that programs accredited within the previous five years, as well as programs that were under for-profit ownership were more likely to go unfilled.[9] Another study found that predictors of not filling were having unfilled positions in the previous Match, a smaller program size, location in the Mid-Atlantic or East North Central area, prior American Osteopathic Association accreditation, and corporate ownership structure.[10] Overall, programs felt their match outcomes were worse than in previous years, but they perceived the quality of applicants as similar to previous years.[5]

Many factors influence a student's decision on which specialty to pursue including role models, financial incentives, gender, degree of patient contact, procedural skills, prestige, and lifestyle.[11–14] The factors most associated with a choice to specialize in EM include lifestyle, diversity of patient presentations, flexibility in choosing a practice location, work-life balance, and perceived job satisfaction.[15–19] Factors associated with earlier selection of EM include early exposure to the field, presence of an EM residency program at a student's medical school, prior employment in the ED, previous experience as a prehospital practitioner, and completion of a third-year EM clerkship.[16]

In this study we surveyed EM applicants from 2022 and 2023 to identify factors deterring or attracting them to the specialty as well as modifiable influences impacting their career decisions. To restore the competitive nature of EM in the Match, it is important to know what motivates medical students to select EM as a specialty in the current environment. It is additionally important to further understand the factors contributing to decreased interest in EM, so that we can continue to address these as a specialty.

Population Health Research Capsule

What do we already know about this issue?
Applicant and specialty characteristics attracting applicants to EM have been previously documented.

What was the research question?
What factors deterred and attracted applicants to EM during the 2023 Match?

What was the major finding of the study?
The 4th-year clerkship was the major attracting factor (mean 4.62, 95% CI 4.50–4.74), while corporate influence (mean 2.51, 95% CI 2.33–2.69) was the strongest deterring factor.

How does this improve population health?
These findings offer new insights into applicant perspectives of EM and specialty-choice considerations following the 2023 Match.

METHODS

The project was conceived by the Council of Residency Directors in Emergency Medicine (CORD) Match Task Force, which includes representatives from the American Academy of Emergency Medicine (AAEM), American Academy of Emergency Medicine Resident and Student Association (AAEM/RSA), American College of Emergency Physicians (ACEP), American College of Osteopathic Emergency Physicians (ACOEP), ACOEP Resident and Student Organization (ACOEP RSO), Association of Academic Chairs in Emergency Medicine (AACEM), CORD, Emergency Medicine Residents' Association (EMRA), the Society for Academic Emergency Medicine (SAEM), and SAEM Residents and Medical Students (SAEM RAMS). Task force members collaborated to design the survey instrument. The conclusions in this paper represent the views and opinions of the individual authors and do not represent the views of the organizations. The

study was approved by the Loma Linda University Health Institutional Review Board.

We performed a literature review using PubMed to collect studies investigating factors impacting residency applicants' specialty choice. Questions were adapted from prior published studies.[16,20] Current factors not previously investigated, such as COVID-19 or EM workforce projections, were added following an iterative process of consensus development within the research group. The survey was reviewed by the CORD Match Task Force members and edited. The survey was then pilot-tested by current medical students and residents. We analyzed the responses, and the survey was revised for clarity and brevity following the beta respondents' feedback.

Medical students were asked multiple-choice questions regarding their residency application strategy including whether they had applied to more than one specialty and, if so, which specialties they applied to. The survey participants were asked to rank specialty characteristics influencing their choice of EM as a career on a five-point Likert scale from strongly positive to strongly negative. They were also asked to rank the impact of prior experiences on their specialty choice on a five-point Likert scale from very positive to very negative. We investigated the impact of career advisement using multiple-choice questions with the option to select up to three responses. Finally, free-text response questions were asked to assess applicants' opinions about the causative factors leading to the 2023 EM Match results. Comment in this space was optional and not meant to reach saturation of themes; rather, it was meant to provide participants the opportunity to give additional details about their experiences.

We used a convenience sample of EM-bound medical students who applied in both the 2022 and 2023 Match and those who considered or are considering applying to EM in upcoming Match cycles. Survey respondents were sent a web-based survey via Qualtrics (Qualtrics International, Inc, Seattle, WA) in the summer of 2023. Reminder messages were distributed monthly during the data collection period. The survey was distributed through the listservs of current medical students interested in EM as identified by their membership in an EM national organization including AAEM/RSA, ACOEP RSO, EMRA, and SAEM RAMS. Surveys were also distributed through the SAEM Clerkship Directors in Emergency Medicine (CDEM) listserv to be sent to their recently matched applicants who matched into EM or had considered but ultimately decided not to pursue EM. Convenience sampling via listserv distribution did not allow for survey distribution quantification or response-rate calculation. Comparing the number of survey responses (213) to the number of applicants to EM in the 2023 Match (2,765) shows our survey responses were equal to 7.7% of the total number of EM applicants in 2023. The intended survey participants included medical students who 1) considered but ultimately did not apply to EM residency; 2) applied to EM as their only specialty choice; 3) dual applied to EM and an alternate specialty choice; or 4) entered EM through the SOAP.

A financial incentive of a $10 electronic gift card was given to the first 160 participants. Financial support for the study was provided by AAEM, AAEM/RSA, ACEP, ACOEP, AACEM, CORD, and SAEM.

We analyzed data using Microsoft Excel 365 (Microsoft Corporation, Redmond, WA) to calculate means and percentages. We calculated 95% confidence intervals (CI) using an online tool.[21] A phenomenological approach to qualitative analysis was used and free-text responses were coded by two authors with experience in qualitative analysis (JM, BM) after establishing a codebook through an iterative process to generate an understanding of the phenomenon of the EM match process in concert with the quantitative questions. Any disagreements between codes were resolved by a third author (MK).

RESULTS

We received responses from 213 individuals. Demographics are shown in Table 1. Most respondents (92.8%) had applied to residency already. Of those, 87.2% applied to EM in the Match. Respondents secured an EM residency position in the 2023 Match (69.5%), 2022 Match (9.6%), 2023 SOAP (12.3%), 2022 SOAP (0.5%), and by other means (5.3%). A small proportion of respondents (2.7%) were not entering EM residency.

In comparison to applicants securing a position in the 2023 Match, our sample was fairly similar with regard to gender breakdown (57.2% male, 39.9% female in our sample vs 54.8% male, 45.2% female in the Match) but oversampled osteopathic seniors (42.7% in our study vs 24.3% in the Match). Regarding application strategy, 70.1% applied to only EM residencies. Some individuals applied to more than one specialty with EM preferred (12.3%). The most common secondary specialties were internal medicine and family medicine. Applying to EM as the secondary specialty occurred in 2.1% of individuals with primary specialties being anesthesiology, interventional radiology, orthopedic surgery, and physical medicine and rehabilitation. Respondents who chose not to apply to EM at all made up 13.4% of responses. This group of individuals most commonly chose to apply to anesthesiology (39.1%), orthopedic surgery (17.4%), general surgery (17.4%), family medicine (13.0%), internal medicine, pathology, and preliminary year (each 8.7%). (Response option was "Select all that apply," response sum >100%).

Applicants most commonly chose to apply to EM in the third year of medical school (33.5%) or before medical school (33.0%). The remaining responses were evenly split among the pre-clinical years of medical school (6.8%), the fourth year of medical school (8.9%), after medical school (6.8%),

Table 1. Demographic data of survey respondents.

Characteristics	
Age (years) (n = 173)	N (%)
<25	1 (0.6%)
25–29	108 (62.4%)
30–34	47 (27.2%)
35–39	13 (7.5%)
40–44	2 (1.2%)
>44	2 (1.2%)
Gender identity (n = 173)	
Male	99 (57.2%)
Female	69 (39.9%)
Non-binary/third gender	1 (0.6%)
Prefer not to say	4 (2.3%)
Race (n = 177)	
American Indian/Alaska Native	1 (0.6%)
Asian	20 (11.3%)
Black/African American	10 (5.6%)
Hawaiian/Pacific Islander	0
White	132 (74.6%)
Other	8 (4.5%)
Prefer not to say	6 (3.4%)
Ethnicity (n = 173)	
Hispanic/Latino	18 (10.4%)
Not Hispanic/Latino	147 (85.0%)
Prefer not to say	8 (4.6%)
Medical school background (n = 211)	
MD in US	85 (40.3%)
DO in US	90 (42.7%)
US citizen IMG	28 (13.3%)
Non-US citizen IMG	8 (3.8%)
Medical school type (n = 171)	
Private	103 (60.2%)
Public	67 (39.2%)
Other	1 (0.6%)
Medical school geographic region (n = 171)	
Central (IA, IL, IN, KS, MI, MN, MO, MT, ND, NE, OH, SD, WI)	43 (25.1%)
Northeast (CT, DC, DE, MA, MD, ME, NH, NJ, PA, RI, VT)	29 (17.0%)
South (AL, AR, FL, GA, KY, LA, OK, MS, NC, SC, TN, TX, VA, WV)	70 (40.9%)
West (AK, AZ, CA, CO, HI, ID, NM, NV, OR, UT, WA, WY)	29 (17.0%)

IMG, international medical graduate; *MD*, Doctor of Medicine; *DO*, Doctor or Osteopathic Medicine.

and during SOAP (8.4%). Participants were exposed to EM in their medical school via required EM clerkships in the fourth year (42.1%), required clerkships in the third year (24.0%), EM electives in the fourth year (17.0%), and EM electives in the third year (11.1%). Table 2 shows the degree of influence each factor held in the applicants' choice of EM as a career. The most frequently cited positive influences were EM residents on shift (4.42 on a 1–5 scale), EM attendings on shift (4.29), the fourth-year EM clerkship (4.62), and third-year EM clerkship/elective (4.53). Prior experience in the ED in a non-physician role (4.43), in emergency medical services (EMS) (4.52) or as a scribe (4.55), were identified less frequently but as very positive factors.

Job concerns/workforce report (65.8%), burnout (56.7%), increased use of advanced practice practitioners (APP) (50.8%), and corporate influence in EM (42.5%) were the most-cited reasons for advising applicants away from EM. Emergency department crowding (12.5%) and EM experience during the COVID-19 pandemic (5.8%) were less commonly cited concerns. Participants were asked about advisement and its influence on their specialty choice: 68.5% reported being advised against choosing EM residency training. The most common sources of advisement away from EM were attendings/residents in non-EM specialties (73.3%), peers (50.0%), social media/message boards (47.5%), and EM attendings (37.5%). Medical school representatives in the Dean's office accounted for a small proportion of advisement away from EM (15.8%). Most participants in our survey (81.8%) reported that advising against entering EM did not change their application strategy. Of those who initially pursued a different specialty 5.7% ultimately entered EM in the SOAP, 5.0% applied to another specialty as a backup to EM, and 3.3% applied to EM as a backup specialty. Of those applicants who did not change application strategy despite negative advice about EM, the most commonly cited reasons were perceived fit with EM (73.7%), flexible lifestyle of EM (64.6%), lack of interest in other specialties (49.5%), and doubt in accuracy of workforce report (49.5%).

Very few participants said they would not advise a friend to apply to EM for the 2024 Match (2.3%). Most (75%) would advise a friend to choose EM. Most of those who indicated they would advise a friend against applying to EM would do so because of concerns about fit for the specialty (42.9%) and the job market (22.9%), with corporatization of medicine, APP expansion, and burnout also mentioned.

Most somewhat agreed or strongly agreed that their peers would be more interested in EM as a career if they were exposed to EM during a rotation in the third year or earlier (82.7%). Participants were asked what they thought would make EM more appealing to peers who were undecided

Table 2. Factors influencing selection of career in emergency medicine.

What factors influenced your choice of EM as a career?	Strongly positive (5)	Somewhat positive (4)	Neutral (3)	Somewhat negative (2)	Strongly negative (1)	Mean (95% CI)
4th-year EM clerkship	118	26	8	3	2	4.62 (4.50, 4.74)
Worked as scribe in ED	40	12	5	0	1	4.55 (4.35, 4.75)
3rd-year EM clerkship/elective	79	27	5	2	3	4.53 (4.37, 4.69)
Worked in EMS outside hospital	32	7	2	2	1	4.52 (4.24, 4.80)
Shadowing experience in ED	44	24	5	3	0	4.43 (4.25, 4.61)
Worked non-physician role in ED	24	10	5	1	0	4.43 (4.18, 4.68)
ED residents on shift	81	52	14	1	1	4.42 (4.30, 4.54)
Other	8	3	0	0	1	4.42 (3.79, 5.05)
Family/friend is emergency physician	33	27	10	1	0	4.30 (4.12, 4.48)
ED attending on shift	75	61	13	4	3	4.29 (4.15, 4.43)
Mentor/advisor	54	35	12	6	2	4.22 (4.04, 4.40)
Volunteer experience in ED	22	21	9	1	0	4.21 (4.00, 4.42)
EM experience in preclinical years	37	28	16	5	0	4.12 (3.92, 4.32)
EM related research	17	21	24	1	1	3.81 (3.59, 4.03)
Word of mouth/reputation	22	44	22	14	8	3.53 (3.31, 3.75)

CI, confidence interval; *EM*, emergency medicine; *ED*, emergency department; *EMS*, emergency medical services.

about a specialty but were considering EM. The most common responses included early exposure to EM (31.5%) and alleviating concerns about job security raised by the EM workforce report (30.2%). Other suggestions included addressing the expanded use of APPs in the ED (10.1%), improving the perception of EM among medical students and physicians (9.4%), and improving work-life balance and compensation (8.7% and 8.1%, respectively).

Table 3 shows how applicants ranked different factors when choosing EM as a career. The most important positive factors were variety of patient pathology (4.66 on a 1–5 scale), lifestyle/flexibility (4.63), high-acuity patient care (4.43), length of residency training (4.37), and family considerations (4.36). Participants were asked specifically if they believed that EM is a "lifestyle specialty," and 60.1% responded yes; 9.0% did not consider EM a lifestyle specialty, while 28.1% were neutral, and 2.8% were unsure. The factors negatively influencing a career choice in EM, defined as 95% CI less than 3.0, were corporate influence in EM (2.51, 2.33–2.69), ED crowding (2.52, 2.37–2.67), burnout (2.59, 2.44–2.74), and use of APPs in EM (2.63, 2.47–2.79). Average rating of concerns about EM experience during the COVID-19 pandemic (2.95) and workforce report/job security was negative (2.85); however, upper limit of 95% CI was positive, 3.12 and 3.03, respectively.

Applicants were asked to identify the most important reason contributing to a larger-than-normal number of unfilled positions in the EM Match. They identified concerns about job security and the future EM workforce as the primary concern (Table 4). Qualitative responses to the increase in unfilled spots in the EM Match predominantly reflected concerns regarding the EM workforce report and job security. Themes and representative quotations are included in Table 5.

DISCUSSION

Applicants in our survey were drawn to EM by clinical experiences in the ED during the third and fourth year and by interactions with ED residents and attending physicians during those experiences. Unfortunately, only a small proportion of applicants in our survey had required EM clinical experience during the third year of training. Developing best practice recommendations for early exposure to EM during medical school may be an area to target to increase interest in future applicants. Additionally, employment in an EM-related field (ie, EMS, scribe) prior to medical school was also a positive experience. Early identification of those students with prior EM-related employment may be an area for mentorship efforts by EM advisors.

Applicants continue to be drawn to the high-acuity patient care, diverse patient pathology, and the flexible lifestyle EM offers. These findings are in line with prior studies of EM applicant attitudes and the cornerstone of EM's appeal.[12–19,23] Additional factors that appeal to applicants are the variety of fellowship options available after EM residency, the length of residency training, compensation, and availability of jobs in their desired location. Family considerations are important to applicants and, coupled with the desire for a flexible lifestyle, signal a desire for work-life balance. Shift work in the ED has downsides such as sleep

Table 3. Importance of various aspects of emergency medicine to applicants in the 2023 Match.

How important were the following factors in your decision to apply to EM residency	Strongly positive (5)	Moderately positive (4)	Neutral (3)	Moderately negative (2)	Strongly negative (1)	Does not apply	Mean (95% CI)
Variety of pathology	132	24	16	1	0	5	4.66 (4.56, 4.76)
Lifestyle/flexibility	124	39	11	1	0	3	4.63 (4.54, 4.72)
High-acuity patient care	101	47	24	1	0	5	4.43 (4.32, 4.54)
Length of residency training	89	62	21	2	0	4	4.37 (4.26, 4.48)
Family considerations	95	52	22	5	0	4	4.36 (4.24, 4.48)
Compensation/salary	57	79	27	10	0	5	4.06 (3.93, 4.19)
Mentor/advisor influence	61	55	40	7	2	13	4.01 (3.87, 4.15)
Fellowship options	44	56	59	5	4	10	3.78 (3.64, 3.92)
Availability of jobs in desired location	41	67	40	19	4	7	3.71 (3.56, 3.86)
Competitiveness of EM match	30	47	83	6	3	9	3.56 (3.43, 3.69)
Student debt	18	54	70	11	3	22	3.47 (3.34, 3.61)
Career longevity	29	42	59	38	5	5	3.30 (3.14, 3.46)
COVID-19 experience in EM	20	24	69	39	17	9	2.95 (2.78, 3.12)
EM workforce report/job security	20	21	59	48	19	11	2.85 (2.68, 3.03)
APPs in EM	11	17	64	47	27	12	2.63 (2.47, 2.79)
Burnout in EM	13	12	57	75	17	4	2.59 (2.44, 2.74)
ED crowding	8	12	67	56	27	8	2.52 (2.37, 2.67)
Corporate influence in EM	16	14	48	50	39	11	2.51 (2.33, 2.69)

APPs, advanced practice practitioners; *CI*, confidence interval; *EM*, emergency medicine; *ED*, emergency department.

transitions associated with night shifts and working weekends and holidays. However, applicants were signaling those issues are still favorable to being on call or working in a clinic five days a week. Highlighting the factors that resonate with applicants is a good starting point when promoting the specialty.

Table 4. Single most important reason for unfilled emergency medicine (EM) residency positions in 2022 and 2023 Match, per EM applicants.

Response	N%
Workforce/job security	79 (53.0%)
COVID-19	28 (18.8%)
Number of residencies	20 (13.4%)
Burnout	17 (11.4%)
APP expansion	15 (10.1%)
Perception of emergency medicine	15 (10.1%)
Quality of life, change in practice environment (boarding, volumes, etc)	11 (7.4%)
Corporatization	8 (5.4%)
Other	6 (4.0%)
Programs' failure to adapt to changing applicant pool	2 (1.3%)

Note: Totals exceed 100%, as respondents could indicate more than one item; % indicates the percent of total respondents endorsing a choice.
APP, advanced practice practitioner; *EM*, emergency medicine.

With regard to factors pushing applicants away from EM, most applicants experienced badmouthing of EM and advising away from the specialty. In prior studies, over three-quarters of respondents reported experience with badmouthing of another specialty and one-quarter changed their specialty choice because of it.[24–26] When uncertain applicants are narrowing their specialty choices between a few serious options, contending with negativity about your career choice, both now and in the future, from friends or mentors in other specialties may be enough to sway someone away from EM.

The most common source of advice against EM in 2023 was not from peers, formal mentors, or Dean's offices but from attendings and residents in non-EM specialties. Experiencing negative advisement from a trusted mentor about one's desired specialty is likely impactful. In addition, applicants reported receiving negative pressure from their peers and social media. Most people involved in EM medical education suspected applicants were being advised away from EM. This was suggested by our data. Most assumed advisors from the Dean's office were advising students away from EM toward more prestigious specialties or those with safer match rates. But that was not the case in our survey, as

Table 5. Qualitative analysis themes and representative quotations regarding the 2022 and 2023 EM match.

Theme	Code	Guideline for use
Employment opportunities	**Workforce/job security**	**This code is used when participants discuss the workforce report, job security, employment opportunities, or difficulty finding jobs**
• *There is a myth going around that there are not enough jobs for EM physicians after residency. I know a lot of people that made this comment upon saying I was applying to EM* • *Covid, and that damn memo. Yall shot yourselves in the damn foot with that bonehead move* • *Workforce report hysteria* • *The infamous report predicting a coming labor surplus. The timing lines up and it tracks with what friends in med school were saying*		
	Number of residencies	**This code is used when participants discuss residency expansion**
• *Increased amount of residency program spots created by CMG hospitals* • *Too many residency programs* • *Surplus of "pop-up" programs leveraging resident labor with no intention of real training*		
	APP expansion	**This code is used when participants discuss competition with APPs for employment or increased use of APPs in EM**
• *Midlevel creep* • *increasing number of NPs/PAs filling in positions* • *PA/NP takeover* • *Increased NP/ PA replacing jobs and then MD license online for anything they do. Including signing their charts*		
Practice environment	**Burnout**	**This code is used when participants discuss burnout**
• *Concern over burnout* • *Fear of burnout* • *Emergency doctors burnt out*		
	COVID-19	**This code is used when participants discuss the impact of COVID-19**
• *Treatment during COVID-19* • *COVID-19 experiences, lack of patient care opportunities during COVID-19* • *High stress, especially during COVID-19* • *COVID-19 showed EM's true colors* • *COVID-19 experiences and fears of future health risks*		
	Corporatization	**This code is used when participants discuss corporatization of emergency medicine or private equity influence**
• *Corporate takeover, thus physicians lose power every day* • *Corporate practice of medicine* • *HCA programs!!!!! There are a ton of new, sketchy programs.* • *Increase in for-profit hospital slots available in Texas, Cali, and Florida*		
	Quality of life, change in practice environment (boarding, volume, etc.)	**This code is used when participants discuss negative practice factors**
• *Lack of perceived quality of life* • *Bad job prospects and ED culture has become toxic* • *Seeing patients in waiting rooms/bed holds* • *Culture of what EM has become. No one wants to choose to work in this over run environment especially when the job market is uncertain when there are specialties like dermatology and sub- specialties where you don't have to deal with the chaos and patient volumes we are now seeing in the ED. ER medicine is at an all-time low and never used to be this overwhelming pre-pandemic.*		
Applicant or match factors	**Programs' failure to adapt to changing applicant pool**	**This code is used when participants discuss residency programs' failure to assess competitiveness or select applicants efficiently**
• *Mismatch between programs' opinion of themselves/how they are perceived vs actual applicant perceptions of programs.* • *Programs being overly selective and not honestly introspecting regarding how applicants perceive their program*		

(*Continued on next page*)

Table 5. Continued.

Theme	Code	Guideline for use
	Perception of emergency medicine	**This code is used when participants discuss negative perceptions of emergency medicine among students or through social media or mentors**
	• *Lack of respect to emergency physicians and thought that we are not that smart* • *Perception from attendings of both EM and non-EM* • *Social media influence and immaturity on behalf of applicants* • *Decreased perceived competitiveness leading to lack of interest* • *Bad reputation among consultant specialties* • *Jack of all trades/EM incompetency stigma*	

APP, advanced practice practitioner; *CMG*, contract management group; *EM*, emergency medicine; *ED*, emergency department; *HCA*, Hospital Corporation of America; *NP*, nurse practitioner; *PA*, physician assistant.

advisors in the Dean's office ranked as the sixth most frequent source of advisement away from EM.

Additional factors pushing applicants away from EM were corporate influence in EM, ED crowding, burnout, the use of APPs in EM, the experience of emergency physicians during COVID-19, and concerns regarding job security stemming from the 2021 EM workforce report. Applicants are wary of entering a specialty dominated by corporations that place profits over patient care. Residencies at for-profit clinical sites had 1.3 times greater risk of not filling in 2023.[9] Applicants are showing an aversion to training at these sites. However, spots continue to fill during the time-limited SOAP as unmatched applicants are likely excited about the ability to secure any training position. Further understanding applicant concerns and the experiences of residents in for-profit programs is important and requires additional study. Likewise, understanding the experience of EM residents who enter training via the SOAP is valuable for future investigation.

Emergency department crowding not only negatively impacts quality of patient care; it also deters future emergency physicians from entering the field. Students on ED rotations see the challenges of finding space to re-evaluate patients, delays in workup, and prolonged care of patients boarding in the ED who are awaiting inpatient beds. Efforts to address boarding as well as the implementation of surge capacity plans may result in improving this factor as students consider specialty choice.

Furthermore, burnout generated the largest number of moderate or strongly negative responses. Emergency medicine is widely cited as the specialty with the highest rates of burnout.[27,28] Requirements to promote well-being and counter burnout exist in both undergraduate (Liaison Committee on Medical Education standard 12.3)[29] and graduate medical education (Accreditation Council for Graduate Medical Education Common Program Requirements for residency VI.C).[30] Prior qualitative research suggests faculty modeling may influence residents' career perspectives, indicating targeting faculty for education on well-being and burnout may yield substantial benefits for both current and prospective residents.[31]

Applicants, additionally, have concerns about the use of APPs in the ED. Many free-text responses cited "scope creep" of APPs as well as the negative impact on physician job availability as negative factors. Applicants signaled that they are paying attention to the topic of APP usage in the ED and it is an important issue to them. National leaders in EM are actively working to protect the scope of all practitioners in the ED and continue to emphasize the importance of physician-led patient care teams. Further dissemination of these advocacy efforts and the effects on our specialty would be beneficial for applicants.

Lastly, the workforce report has been frequently hypothesized as a major contributing factor to the rapid decline in EM residency applications over the last two years.[8] Applicants to EM in our survey confirmed this hypothesis, citing projections stemming from the report as the most important factor leading to the significant rise in unfilled EM residency positions in the 2022 and 2023 Matches. Subsequent studies have addressed workforce considerations such as physician attrition and geographic distribution.[32,33] Further investigation and clarity into the future EM workforce would aid applicants as they weigh their career decisions.

Reinforcing the positive aspects of EM while addressing the negative factors above will go a long way toward bolstering the EM applicant pool and future workforce. The 2023 EM Match was unprecedented with 554 unmatched positions. However, EM still matched 2,456 applicants, the fourth largest number in the 2023 Match.[3] Our survey yields insights into the positive aspects of EM that draw applicants to the specialty and identifies negative factors following the 2023 EM Match.

LIMITATIONS

Our survey may be impacted by selection bias as our distribution method did not guarantee that every residency applicant who considered applying to EM residency was included. For this reason, survey response rate was not calculated, and it is unknown to what extent our results are representative of all EM residency applicants in the 2022 and 2023 Match cycles. Additionally, recall bias may also contribute as responses from applicants who matched to EM in 2022 were included. As potential survey participants were identified through their membership in national EM resident and student organizations, this study may not be representative of individuals who considered EM early in their medical school career and ultimately did not pursue EM. The exact number of individuals who received the survey solicitation is not known, making it impossible to calculate a response rate. Our survey responses represent 7.7% of the total number of applicants to EM in 2023, although it is unlikely the survey reached all applicants in the pool. Future studies may benefit from a longitudinal approach soliciting EM interest-group participants in the first two years of medical school and following them through their respective Match years to improve response rate.

CONCLUSION

The specialty of emergency medicine experienced a sharp increase in unfilled positions in the 2022 and 2023 matches. Most applicants received advisement away from EM with the most common source being physicians in non-EM specialties. Applicants perceive corporate influence in EM, ED crowding, burnout, influence of advanced practice practitioners in EM, and workforce concerns as driving forces behind the EM Match results. Applicants cited clinical experiences in the ED and interactions with EM attendings and residents as positive factors. High-acuity patient care, diverse patient pathology, and flexible lifestyle were seen as positive characteristics of a career in EM.

ACKNOWLEDGMENTS

The authors would like to thank the boards of directors of AAEM, AAEM/RSA, ACEP, ACOEP, AACEM, CORD, and SAEM for providing funds for participant incentives. The authors would also like to thank AAEM/RSA, ACOEP/RSO, CDEM, EMRA, and SAEM RAMS for assistance with distributing the survey via their respective list-servs and to thank the members of the CORD Match Task Force for assistance in developing the survey tool.

Address for Correspondence: Michael Kiemeney, MD, Loma Linda University School of Medicine, 11234 Anderson St, MC-A208, Loma Linda, CA 92354. Email: mkiemeney@llu.edu

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. Survey incentive support was provided by respective Boards of Directors for AAEM, AAEM/RSA, ACEP, ACOEP, AACEM, CORD, and SAEM. The manuscript represents the individual author's opinions and does not represent the opinions of the organizations providing financial support. There are no other conflicts of interest or sources of funding to declare.

Copyright: © 2025 Kiemeney et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. National resident matching program. Results and data: 2021 main residency match. 2021. Available at: https://www.nrmp.org/wp-content/uploads/2021/08/MRM-Results_and-Data_2021.pdf. Accessed October 3, 2023.
2. National Resident Matching Program. 2022 NRMP main residency match: match rates by specialty and state national resident matching program. 2022. Available at: https://www.nrmp.org/wp-content/uploads/2022/11/2022-Main-Match-Results-and-Data-Final-Revised.pdf. Accessed October 3, 2023.
3. National Resident Matching Program. Results and data: 2023 main residency match. Available at: https://www.nrmp.org/wp-content/uploads/2023/05/2023-Main-Match-Results-and-Data-Book-FINAL.pdf. Accessed October 3, 2023.
4. National Resident Matching Program. Results and data: 2023 main residency match. Page 46. Available at: https://www.nrmp.org/wp-content/uploads/2023/05/2023-Main-Match-Results-and-Data-Book-FINAL.pdf. Accessed October 3, 2023.
5. Murano T, Weizberg M, Burns B, et al. Deciphering a changing match environment in emergency medicine and identifying residency program needs. *West J Emerg Med.* 2023;24(1):1–7.
6. Lewis M, Williams K, Timpe J, et al. The 2022 and 2023 emergency medicine residency match: a cautionary tale. *Cureus.* 2023;15(5):e38601.
7. American Academy of Emergency Medicine. Corporate practice. Available at: https://www.aaem.org/publications/key-issues/corporate-practice/. Accessed October 24, 2024.
8. Marco CA, Courtney DM, Ling LJ, et al. The emergency medicine physician workforce: projections for 2030. *Ann Emerg Med.* 2021;78(6):726–37.
9. Gettel CJ, Bennett CL, Rothenberg C, et al. Unfilled in emergency medicine: an analysis of the 2022 and 2023 match by program accreditation, ownership, and geography. *AEM Educ Train.* 2023;7(4):e10902.
10. Preiksaitis C, Krzyzaniak S, Bowers K, et al. Characteristics of emergency medicine residency programs with unfilled positions in the 2023 match. *Ann Emerg Med.* 2023;82(5):598–607.

11. Yoon JD, Ham SA, Reddy ST, et al. Role models' influence on specialty choice for residency training: a national longitudinal study. *J Grad Med Educ.* 2018;10(2):149–54.
12. DeZee KJ, Maurer D, Colt R, et al. Effect of financial remuneration on specialty choice of fourth-year U.S. medical students. *Acad Med.* 2011;86(2):187–93.
13. Lambert EM and Holmboe ES. The relationship between specialty choice and gender of U.S. medical students, 1990–2003. *Acad Med.* 2005;80(9):797–802.
14. Teitelbaum HS, Ehrlich N, Travis L. Factors affecting specialty choice among osteopathic medical students. *Acad Med.* 2009;84(6):718–23.
15. Rosen B, Rosen P, Schofer J, et al. Is emergency medicine the right choice for me? *J Emerg Med.* 2019;56(3):e35–8.
16. Ray JC, Hopson LR, Peterson W, et al. Choosing emergency medicine: influences on medical students' choice of emergency medicine. *PLoS One.* 2018;13(5):e0196639.
17. Boyd JS, Clyne B, Reinert SE, et al. Emergency medicine career choice: a profile of factors and Influences from the Association of American Medical Colleges (AAMC) graduation questionnaires. *Acad Emerg Med.* 2009;16(6):544–9.
18. Keith KC, Smith E, Reddy S, et al. Lifestyle factors and other influences on medical students choosing a career in emergency medicine. *AEM Educ Train.* 2021;5(1):37–42.
19. Kazzi AA, Langdorf MI, Ghadishah D, et al. Motivations for a career in emergency medicine: a profile of the 1996 US applicant pool. *CJEM.* 2001;3(02):99–104.
20. AAMC. Graduation questionnaire (GQ). 2024. Available at: https://www.aamc.org/data-reports/students-residents/report/graduation-questionnaire-gq. Accessed May 15, 2024.
21. Caculator.net. Confidence interval calculator. Available at: https://www.calculator.net/confidence-interval-calculator.html. Accessed February 6, 2024.
22. Emergency Medicine Residents' Association. Consensus statement for the emergency medicine 2022–2023 residency application cycle regarding emergency medicine away rotations. 2022. Available at: https://www.emra.org/be-involved/be-an-advocate/working-for-you/statement-for-residency-application-cycle-em-away-rotations. Accessed May 7, 2024.
23. Mackey C, Feldman J, Peng C, et al. How do emergency medicine applicants evaluate residency programs in the post-COVID-19 era? *AEM Educ Train.* 2022;6(6):e10805.
24. Ajaz A, David R, Brown D, et al. BASH: Badmouthing, attitudes and stigmatisation in healthcare as experienced by medical students. *BJPsych Bull.* 2016;40(2):97–102.
25. Holmes D, Tumiel-Berhalter LM, Zayas LE, et al. "Bashing" of medical specialties: students' experiences and recommendations. *Fam Med.* 2008;40(6):400–6.
26. Alston M, Cawse-Lucas J, Hughes LS, et al. The persistence of specialty disrespect: student perspectives. *PRiMER.* 2019;3:1.
27. Shanafelt TD, Boone S, Tan L, et al. Burnout and satisfaction with work-life balance among US physicians relative to the general US population. *Arch Intern Med.* 2012;172(18):1377–85.
28. Lu DW, Dresden S, McCloskey C, et al. Impact of burnout on self-reported patient care among emergency physicians. *West J Emerg Med.* 2015;16(7):996–1001.
29. Liaison Committee on Medical Education. Functions and structure of a medical school. Standards for accreditation of medical education programs leading to the MD degree. 2023. Available at: https://lcme.org/publications/. Accessed October 3, 2023.
30. ACGME. Common program requirements for residency, effective July 1, 2023. https://www.acgme.org/programs-and-institutions/programs/common-program-requirements/.
31. Lu DW, Germann CA, Nelson SW, et al. "Pulling the parachute": a qualitative study of burnout's influence on emergency medicine resident career choices. *AEM Educ Train.* 2020;5(3):e10535.
32. Gettel CJ, Courtney DM, Janke AT, et al. The 2013 to 2019 emergency medicine workforce: clinician entry and attrition across the US geography. *Ann Emerg Med.* 2022;80(3):260–71.
33. Gettel CJ, Courtney DM, Agrawal P, et al. Emergency medicine physician workforce attrition differences by age and gender. *Acad Emerg Med.* 2023;30(11):1092–100.

Emergency Medicine Residency Website Wellness Pages: A Content Analysis

Alexandra Sappington, DO*
Brian Milman, MD†

*Louisiana State University Health Sciences Center, Department of Emergency Medicine, New Orleans, Louisiana
†University of Texas Southwestern Medical Center, Department of Emergency Medicine, Dallas, Texas

Section Editor: Jules Jung, MD, MED
Submission history: Submitted August 28, 2024; Revision received February 16, 2025; Accepted February 21, 2025
Electronically published May 16, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI 10.5811/westjem.34873

Introduction: The COVID-19 pandemic impacted the way medical students seek residency positions. In 2020, the Accreditation Council for Graduate Medical Education advocated for virtual interviews. Most emergency medicine (EM) interviews in 2023 remained virtual, and this format will persist for the foreseeable future. Since students are not evaluating programs in person in most cases, residency websites are crucial for prospective residents. Resident wellness is critical for resident training and important to prospective residents; it follows that programs must be transparent about resident wellness on websites. In this study we aimed to quantify the number of EM programs with wellness pages on their websites and identify themes portrayed on those pages.

Methods: We analyzed residency website wellness pages from EM websites based on the 2022 directory of the Electronic Residency Application Service. We independently coded wellness statements through an inductive process. Codes were revised iteratively to consensus and organized into themes.

Results: We identified 278 (100%) EM residency websites. Of these websites, 57 (20.5%) had a wellness page, 45 (16.2%) linked to an institutional page that discussed wellness, 169 (60.8%) discussed wellness themes on their website in areas other than a wellness page, and 69 (24.8%) had no direct mention of wellness anywhere on their website. Using this information, we identified themes including community involvement, growth and development, nutrition and health, psychological well-being, social and relaxation activities, wellness culture and environment, wellness curriculum, wellness structure and resources, and work-life integration.

Conclusion: Most EM program websites do not include a wellness page. Of the programs that do, we identified important themes. The absence of dedicated wellness pages on most EM websites suggests an opportunity for programs to better communicate their wellness initiatives to applicants, helping them identify programs that align with their values. [West J Emerg Med. 2025;26(3)573–579.]

INTRODUCTION

Physician wellness is critical.[1] Burnout, as defined in the 1970s by Herbert Freudenberger, details the repercussions of significant amounts of stress in "helping professions."[2] Emergency medicine (EM) has a higher rate of burnout when compared to other specialties.[3] A national EM resident wellness survey study disseminated in 2017 found that 77.7% of residents were identified as burned out.[4] The COVID-19 pandemic exacerbated levels of burnout in subsequent years.[3]

The COVID-19 pandemic also created a shift in the way medical students apply for residency. Specifically, in June 2020 the Accreditation Council for Graduate Medical Education released a statement that advocated for virtual interviews.[5] The Association of American Medical Colleges advocated for a

continuation of virtual interviews for the 2022-2023 cycle, as it eliminates financial and scheduling challenges for programs and applicants. The Council of Residency Directors in Emergency Medicine further encouraged EM residency programs to follow virtual interview guidelines. It appears that virtual residency interviews will remain the dominant format for years to come. Emergency medicine-bound students list program websites as the most important factor in determining their rank lists in the post-COVID-19 era and rank program websites as important in determining faculty reputation, program diversity and inclusion, and program culture.[6,7] We can expect EM students to continue to rely heavily on program websites for the foreseeable future.

Residency training is known to have negative effects on physical, emotional, and social wellbeing.[8] Eliminating the in-person evaluation of perceived happiness and comradery among residents will require programs to be transparent about resident wellness on websites.[5] A survey conducted in 2022 showed that resident wellness was identified by medical students as the most important content on a residency website.[9] Studies have been performed evaluating wellness content on program websites in several fields, but not in EM. By analyzing how wellness is presented on EM websites, we aimed to provide insight into the current landscape of this aspect of wellness communication.

Population Health Research Capsule

What do we already know about this issue?
Wellness is important to applicants when deciding how to rank residency programs. However, wellness content is not always available on program websites.

What was the research question?
What percentage of EM programs have a wellness page on their website and what themes are discussed?

What was the major finding of the study?
20.5% of programs had a wellness page, while 24.8% did not mention wellness anywhere on their website.

How does this improve population health?
Enhancing website wellness content can improve applicant decision-making and encourage programs to think deliberatively about their wellness initiatives.

METHODS

We obtained a list of all EM residency programs accepting Electronic Residency Application Service (ERAS) applications for the 2022 application cycle. The EM ERAS directory was accessed in March 2023, and we accessed each EM program website between April 1–April 30, 2023. If the ERAS directory did not link to a program website, we performed a Google search to identify the residency program website. Each program website was reviewed by a single reviewer to determine whether there was a wellness page on the website. We also reviewed each website in its entirety to determine whether other pages on the website discussed themes of wellness or wellbeing. If a website linked to an institutional page discussing wellness separate from the residency website, that page was reviewed as well. Wellness pages and linked graduate medical education (GME) pages were recorded in an Excel spreadsheet with the full text from that webpage.

At the time of analysis, AS was a medical student, bringing a unique perspective as a prospective applicant navigating the residency application process. BM was an associate program director during analysis. The combination of these viewpoints allowed for a more comprehensive understanding of the wellness information presented on residency program websites. Using constructivist grounded theory, each author independently examined the full text from 15 wellness pages to generate initial codes. AS identified 138 descriptive codes, and BM identified 70 descriptive codes (184 unique codes combined). After discussion and review of each of the first 15 statements, areas of overlap were identified, and the initial codes were consolidated into a codebook containing 47 codes.

We independently reviewed an additional 10 website texts, and the codebook was revised. One code was added, two were removed, and five were redefined, resulting in 46 final codes. We then re-coded the first 25 wellness statements using the updated codebook. The coding structure was stable, and no additional codes were added to the codebook. We coded the remaining wellness statements and identified themes. We then held a Zoom meeting to discuss and resolve discrepancies. During this meeting, we reviewed the source text simultaneously with the codebook open. Through discussion and mutual agreement, we resolved all discrepancies without having to involve an additional coder or arbitrator. Themes were identified by grouping related codes into broader conceptual categories that represented patterns in website wellness content. We discussed these themes and agreed upon them. This study was determined to be non-regulated research by the University of Oklahoma Internal Review Board in February 2023.

RESULTS

We identified 278 EM residency programs based on the 2022 ERAS Directory list of participating programs and specialties. Websites were identified and accessed for 278 (100%) programs. Fifty-seven programs (20.5%) had a main page or subpage dedicated to wellness or wellbeing, 169

(60.79%) programs discussed wellness somewhere on their website other than on a page dedicated to wellness, 45 (16.19%) programs linked to a GME page highlighting wellness, and 69 (24.82%) programs did not directly mention wellness or wellbeing anywhere on their website. Programs were counted in multiple categories if information was included in multiple areas of their website.

Of the 57 programs that had a page dedicated to wellness on their departmental website, 22 (38.6%) were titled "Wellness," 12 (21.05%) were titled "Resident Wellness," and the remainder were a variation of wellness or wellbeing. A complete list of page titles can be found in Appendix A. One wellness page contained pictures only, and it was not included in the content analysis. The most common subjects discussed on wellness pages included social events, mental health, physical health, institutional support, wellness didactics, and burnout. The percentage of programs that discussed each subject can be found in Table 1. The least common subjects, defined as <5%, that appeared on residency wellness pages were empathy, achievement, personal development, legal concerns, leadership skill development, lack of personal fulfillment, imposter syndrome, and harassment.

Nine broader themes emerged from analysis of EM residency website wellness pages:

Theme 1: Social and Relaxation Activities

The most common theme that appeared was social and relaxation activities. 83.9% of programs highlighted retreats, class activities, and other social events on their wellness page and 68.4% included pictures of their residents participating in social activities.

> These outings include paintball, large group dinners, and outdoor activities such as skiing and team sports. In the past they have organized softball games and ping-pong and bowling tournaments between the other local EM residencies.

Theme 2: Psychological Wellbeing

Many programs found it difficult to discuss wellness without discussing burnout. Programs also included their approach to mitigating burnout and building resilience.

> Healthcare providers are not immune to poor wellness and well-being, and their high prevalence of burnout, depression, anxiety, and sleep disorders are all contributing factors.

> At this monthly get together, at an attending's house we discuss building resilience and professional excellence and externalizing and highlighting serious threats to wellness like substance abuse, interpersonal conflict, and PTSD.

Table 1. Distribution of wellness topics on emergency medicine residency wellness webpages.

Wellness topic	N (%)
Social events	47 (83.93%)
Mental health	32 (57.14%)
Physical health	31 (55.36%)
Institutional structure	30 (53.57%)
Didactics	29 (51.79%)
Burnout	28 (50.00%)
Food	27 (48.21%)
Resident wellness committee	24 (42.86%)
Culture	23 (41.07%)
Resilience and coping	23 (41.07%)
Work-life balance	22 (39.29%)
Stress	19 (33.93%)
Resources	18 (32.14%)
Finance	17 (30.36%)
Peer support	17 (30.36%)
Professional development	17 (30.36%)
Local amenities	16 (28.57%)
Mentorship	16 (28.57%)
Counseling services	13 (23.21%)
Relaxation	13 (23.21%)
Depression/suicide	11 (19.64%)
Medical health services	10 (17.86%)
Destructive habits	9 (16.07%)
Professional satisfaction	9 (16.07%)
Spiritual health	9 (16.07%)
Family and childcare	9 (16.07%)
National involvement	8 (14.29%)
Self-monitoring	8 (14.29%)
Community service	7 (12.50%)
Definition	7 (12.50%)
Schedule	7 (12.50%)
Coaching	6 (10.71%)
Efficiency	6 (10.71%)
ACGME requirements	5 (8.93%)
Advocacy	4 (7.14%)
Contract negotiations	4 (7.14%)
Scholarship	4 (7.14%)
Harassment	2 (3.57%)
Imposter syndrome	2 (3.57%)
Lack of professional fulfillment	2 (3.57%)
Leadership skill development	2 (3.57%)
Legal concerns	2 (3.57%)
Personal development	2 (3.57%)
Achievement	1 (1.79%)
Empathy	1 (1.79%)

ACGME, Accreditation Council for Graduate Medical Education.

Programs acknowledged that residents are partners in improving wellness and the best initiatives are often resident driven.

> We understood the importance of resident input and feedback into their own wellness. Who else would know what residents need, in terms of wellness, other than residents themselves?

> This year we added a 4th elected chief resident position specifically dedicated to wellness!

Wellness is not one size fits all and frequently requires a more individualized approach.

> We understand that wellness is not mandatory events, meditation, and yoga for everyone. While we have a robust curriculum to explore the different avenues of wellness, we encourage our residents to identify their own stress relieving practices and to maintain those activities to avoid burning out.

> While we know that residency is hard, we also know that "wellness" is a moving target and that which makes a person "well" is highly individualized.

Theme 3: Nutrition and Health

About half of programs mentioned food available to residents while at the hospital and on shift, as well as gyms and other physical fitness resources available to residents.

> Residents have their own dedicated lounge and fully stocked fridge with food and drinks. There are food trucks available at nearly all hours of the night out front of the main facility to take care of those evening and late-night cravings. Tired of the cafeteria food? Need something quick? The snack shack in the main ED provides this – of course available to use with your meal stipend.

Theme 4: Wellness Structure and Resources

Many programs had both departmental and institutional structure to wellness and addressed their holistic approach on their website.

> The infrastructure supports and promotes preventative care, healthy living, mental health, second-victim support, work-life balance, and peer-peer counseling and mentoring.

> Our wellness activities focus on service, resiliency, and career development, and will continue to grow with creative ideas to support and empower residents.

> Through intentional reflective practices, didactic sessions, and interactive social opportunities, our goal is to help residents maintain perspective and create healthy habits that promote longevity in Emergency Medicine.

Programs also included information about counseling services or methods of monitoring mental health throughout residency.

> Trainees are required to complete the Well-being Index twice each year while in their training program. During resident/fellow semi-annual review meetings with their Program Director, one of the topics for discussion will be the trainee's self-care and completion of the Well-being Index.

Additionally, 42.9% of wellness pages talked about a wellness committee.

> Specific goals of the wellness committee include: Promote a healthy work life balance. Provide physical, psychological, social and professional wellness education. Maintain a peer support and advocacy network for the residents.

> The Wellness Committee, made up of attendings and residents from all years, provides resources, workshops and events to build and support the physical, psychological and emotional well-being of our emergency department.

> The Department of Emergency Medicine has established a wellness committee to promote the wellness of its residents through a multifaceted approach that includes education, social programming, mentorship, and organization-directed interventions.

Theme 5: Wellness Culture and Environment

The clinical environment can be an impediment to resident wellness. Some programs discussed their wellness culture and how they can make changes in the clinical and learning environments to positively impact their team.

> Implementing projects designed to improve the meaning residents find in their daily work.

> Advocating for changes in the learning environment that will improve resident well-being without compromising patient care or education."

Theme 6: Wellness Curriculum

Nearly all programs have a didactics section on their website, but 51.8% of programs with wellness pages featured ways that they incorporate wellness topics into their didactic sessions.

> Developing a wellness curriculum that includes traditional lectures (depression, substance use), faculty panels (sleep, work-life balance), guest speakers (financial health), and experiential exercises (yoga, mindfulness).

Theme 7: Work-Life Integration

The scheduling demands of residency are one of the drivers of decreased wellness. Many programs mentioned how their schedule and other residency requirements directly affects wellness.

> Sleep loss has negative effects including learning and cognition which is why it is important to avoid sleepless nights and to watch for circadian violations.

> Resident centric scheduling, maximizing vacation preferences.

> Every block, each residency class will have a protected Wednesday evening as a class after Grand Rounds to spend time as a class, have social events sponsored by the residency program, catch up on appointments, errands, or have family time.

> In order to decrease physician burn-out, our shifts are 8-hours in length. We also encourage our providers to stop seeing new patients 1-hour before shifts end in order to decrease charting-time past your shift. Moreover, as you progress in your residency, the total number of your shifts per block gradually decreases, allowing for more time for other activities.

Theme 8: Growth and Development

Professional growth and development is a natural and necessary part of residency. Many programs outlined various curricula and mentoring programs that help their residents succeed professionally and improve their mental wellbeing.

> The focus of coaching is to improve current performance by helping a person learn how to do things better to reach their desired outcome. The goal of coaching is to help trainees reach their peak potential, personally and professionally while in training.

> Faculty mentors are chosen for their professional and life experience and ability to model and mentor healthy life/work balance and continued joy and success in their practice of medicine. Through the faculty mentorship program, residents are guided through their residency and are able to learn and adopt skills from their mentor's years of experience.

Theme 9: Community Involvement

Although community involvement appeared less frequently than many other themes, some programs highlighted their involvement in wellness and advocacy on a national level.

> Our section strives to provide local, regional and national leadership toward improving the health and wellness of all physicians and healthcare providers. Leaders in our department have been involved in advocating for and promoting local, regional, and national change in the healthcare system with the goal to improve wellness for physicians and healthcare providers.

Forty-five programs linked to a general GME wellness page that applied to all residencies, not just EM. These pages were analyzed as well using the same codebook developed for EM pages. The most common subjects on GME wellness pages included wellness resources, mental health, physical health, and institutional support. All subjects discussed on GME pages can be found in Appendix B.

Most programs (60.79%) discussed their program's commitment and approach to wellness on areas of their website other than a dedicated wellness page. The most common website pages on which themes of wellness were mentioned included PD/Chair Welcome, Curriculum, Why Us, Mission/Values, FAQs, and Overview. The complete list of page titles that include themes of wellness are outlined in Appendix C.

DISCUSSION

Residency applicants strongly consider wellness when determining which programs to apply to and rank.[9] Residency websites are one of the few ways that applicants can learn about a program's approach to wellness. Despite this, only 68.35% of EM residency websites discussed wellness directly on their websites, and only 20.50% had website pages dedicated to wellness. Over half of programs that had wellness pages on their websites discussed social events, mental health, physical health, having institutional structure for wellness, wellness didactics, and burnout.

Forty-five programs linked to institutional pages. These pages were evaluated as well, but the topics that occurred most were different from the sub-themes on EM-specific pages. Conveying wellness information is clearest with a page dedicated to wellness, but wellness information appears throughout residency websites. Students may not access all parts of the website; so featuring wellness information on a prominent section such as a "PD Welcome" section or "Program Highlights" would be most visible.

To our knowledge, this is the first study in EM to explore residency websites for wellness-related statements. In 2021 Pollock et al performed a descriptive analysis of EM residency

websites to characterize the presence of 38 items organized into the following categories: general program information; application process; research; facility information; resident information; lifestyle; and social media.[10] Wellness was not directly assessed in their analysis. A radiology group previously performed a deductive analysis of radiology residency websites to determine the presence or absence of 26 predefined criteria related to resident wellness.[5] They found that financial, clinical, and technical aspects of programs were commonly present on websites, but less than 10% of radiology programs mentioned resident mentoring, wellness committees, or their non-clinical curricula.

Similarly, in internal medicine a group reviewed 579 internal medicine websites for variables that a focus group found to be important to wellness and found that 81% of internal medicine websites mentioned wellness, and 41% had a page dedicated to wellness.[11] Pavuluri et al accessed urology residency websites to determine whether the words "wellness" or "wellbeing" were used anywhere on the website and found that only 20% of programs mentioned one of these terms.[12] Using a two-proportion z-test (P <0.001), we found that in EM, a significantly higher percentage of programs mentioned wellness directly.

In contrast to the reviews published in the radiology, internal medicine, and urology literature, we performed an inductive conceptual analysis. We sought to characterize all concepts discussed on residency wellness pages rather than a predetermined list of criteria. While a deductive approach employed by other groups may be less prone to bias, it also misses important content, and the depth of analysis is limited. Our approach allowed us to assess the topics that residency programs deemed important to convey to applicants or the public. Social events were the most common sub-theme on EM residency websites, with 83.9% of programs discussing events that they hold for residents. In programs that linked to a GME page highlighting wellness the most common subtheme was institutional resources.

While there are no published studies that establish a correlation between a residency website's representation of wellness and actual resident wellbeing, describing website representation of wellness among EM programs is still valuable for residency program leadership, marketing teams, web design teams, and social media teams. We hope that this article will lead programs to enhance the quality of wellness information on their website and, more so, to continue to improve wellness initiatives for their program. After reviewing 278 EM websites, we believe that the following information should be included on EM residency program pages:

1. A subpage dedicated to wellness
2. Feature wellness information in a prominent location such as the program director's message or the program highlights
3. The program's approach to social activities, psychological wellbeing, health, wellness resources, culture, and curriculum focused on wellness
4. Specific examples of programming, curricula, committees, resources, or social events that increase wellness and mitigate burnout through inclusion of descriptions, photos, videos, or linked pages

A comprehensive and mission-aligned description of wellness on the program website could increase medical student interest, engagement, and ultimately recruitment to programs. Additionally, reviewing the approach to each of the themes discussed above may lead programs to improve aspects of their program's overall wellness structure.

LIMITATIONS

Our study provides insight into how EM residency programs convey their wellness structure and culture to applicants through their websites, but it is important to acknowledge some limitations. First, we accessed websites in Spring 2023. Because program websites are constantly evolving, the current website content and page structure may be different from when we reviewed. Additionally, websites are only one way that programs communicate information to applicants. In addition to their website, programs may use social media, virtual meet-and-greet sessions, second-look events, interview days, and other means to highlight aspects of their program's wellness efforts. None of those communication platforms were considered in the current study.

Second, we had a small team, and coding was performed by two individuals. While we followed rigorous methodology and iteratively developed and refined a codebook, this type of analysis lends itself to bias. Third, some programs have multiple websites. In this instance, we did consider all wellness statements if they appeared on any website that was found. While our best efforts were made to include data points from any program website, it is possible we may have missed programs who have multiple websites under varying names or nicknames for the program. Finally, our content analysis was based on the presence of concepts and did not assess the detail or quality of information provided.

CONCLUSION

Residency websites are an important resource for medical students when they are reviewing programs for residency. Information about wellness is important to most students. There is significant variation in how programs address wellness topics on their website; 75.18% of programs discuss wellness either on a dedicated wellness page, in other locations on their website, or on a linked institutional wellness page. Of the 20.5% of programs that have a dedicated page to wellness, they explore themes related to community involvement, growth and development, nutrition and health, psychological wellbeing, social and relaxation activities, wellness culture and environment, wellness curriculum, wellness structure and resources, and work-life integration. We hope this study encourages

improvement in the way EM residency programs present wellness information on their websites, as the internet will continue to be a vital source of information for applicants. Future research could explore the alignment or misalignment between wellness programs offered and the perceived needs of EM residents.

Address for Correspondence: Brian Milman, MD, University of Texas Southwestern Medical Center, Department of Emergency Medicine, 5323 Harry Hines Boulevard E4.300, Dallas, TX 75390-8579. Email: brian.milman@utsouthwestern.edu.

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Sappington et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Battaglioli N, Ankel F, Doty CI, et al. Executive summary from the 2017 Emergency Medicine Resident Wellness Consensus Summit. *West J Emerg Med*. 2018;19(2):332–6.
2. Freudenberger HJ. Staff burn-out. *J Soc Issues*. 1974;30(1):159-65.
3. Shopen N, Schneider A, Aviv Mordechai R, et al. Emergency medicine physician burnout before and during the COVID-19 pandemic. *Isr J Health Policy Res*. 2022;11(1):30.
4. Li-Sauerwine S, Rebillot K, Melamed M, et al. A 2-question summative score correlates with the Maslach Burnout Inventory. *West J Emerg Med*. 2020;21(3):610–7.
5. Wong TY, Huang JJ, Hoffmann JC, et al. Resident wellness in radiology as portrayed by departmental websites. *Acad Radiol*. 2022;(8):1259-65.
6. Taher A, Hart A, Dattani ND, et al. Emergency medicine resident wellness: Lessons learned from a national survey. *CJEM*. 2018;20(5):721-4.
7. Li-Sauerwine S, Weygandt PL, Smylie L, et al. The more things change the more they stay the same: factors influencing emergency medicine residency selection in the virtual era. *AEM Educ Train*. 2023;7(6):e10921.
8. Mackey C, Feldman J, Peng C, et al. How do emergency medicine applicants evaluate residency programs in the post-COVID-19 era? *AEM Educ Train*. 2022;6(6):e10805.
9. Ganguli S, Chen SW, Maghami S, et al. Residency program website content may not meet applicant needs. *Int J Med Stud*. 2024;12(1):60-8.
10. Pollock JR, Weyand JA, Reyes AB, et al. Descriptive analysis of components of emergency medicine residency program websites. *West J Emerg Med*. 2021;22(4):937-42.
11. Storm K, Kelly G, Kottapalli A, et al. Published support for wellness, diversity, equity, and inclusion among internal medicine residency program websites. *Cureus*. 2022;14(9):e29328.
12. Pavuluri H, Malik R, Seideman CA. An assessment of residency wellness programming in urology training programs. *Urology*. 2022;165:113-9.

Inequities in the National Clinical Assessment Tool for Medical Students in the Emergency Department

Bushra Z. Amin, MD*
C. Jessica Dine, MD, MSHP*†§
Erica R. Tabakin, MD*‡
Michael Trotter, MD*‡
Janae K. Heath, MD, MSCE*†

*Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania
†Hospital of the University of Pennsylvania, Department of Medicine, Philadelphia, Pennsylvania
‡Hospital of the University of Pennsylvania, Department of Emergency Medicine, Philadelphia, Pennsylvania
§Leonard Davis Institute of Economics at the University of Pennsylvania, Philadelphia, Pennsylvania

Section Editor: Jules Jung, MD
Submission history: Submitted February 20, 2025; Revision received June 3, 2025; Accepted June 12, 2025
Electronically published October 3, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI 10.5811/westjem.43506

Introduction: The National Clinical Assessment Tool for Emergency Medicine (NCAT-EM) was designed to standardize medical student assessments during emergency medicine clinical rotations. While multiple assessment tools implemented in medical education have been prone to inequities, it remains unknown how student and rater demographics impact NCAT-EM scores. In this study we examined how a student's gender and status as under-represented in medicine (URM) affected NCAT-EM scores.

Methods: This was a retrospective cohort study of all NCAT-EM assessments of clerkship medical students at a single institution in 2022. We performed mixed-effect ordinal logistic regression analyses to determine the association between the seven NCAT-EM domains (history/physical, prioritized differential, formulation of plans, observation/monitoring, emergency management, communication, and global assessment) and student gender, as well as the NCAT-EM domains and students' URM status (specifically in domains of race and ethnicity). We adjusted our analyses for the site of rotation, time, the rater's role (attending or resident), and rater demographics (gender, URM status). We then evaluated the interaction in gender concordance and URM-status concordance on outcomes.

Results: A total of 1,881 NCAT-EM assessment forms were submitted on 142 students completed by 266 raters. There were no significant associations between student gender and NCAT-EM ratings across the seven domains. We found an association between URM students and lower scores in multiple NCAT-EM domains, including global assessment (odds ratio [OR] 0.50, CI 0.25-0.99, $P = .01$); history/physical (OR 0.38, CI 0.19-0.77, $P = .01$); and prioritized differential (OR 0.47, CI 0.26-0.88, $P = .02$). This effect was moderated by a significant positive interaction effect with URM concordance between raters and students in the prioritized differential and observation/monitoring domains.

Conclusion: This is the first study to highlight differences in both gender and status as under-represented in medicine within the nationally implemented NCAT-EM assessment tool. Women students were overall rated similarly across the NCAT-EM domains compared to men, with no association of gender on ratings. However, students' URM status was associated with lower scores in multiple NCAT-EM domains. This finding was mitigated by URM concordance between faculty and resident raters. Our findings support the need for additional studies to understand bias and inequities in the application of the NCAT-EM tool nationally. [West J Emerg Med. 2025;26(5)1250–1259.]

INTRODUCTION

A longstanding challenge in medical education has been to accurately assess medical students on clinical rotations with assessment tools that have strong validity and reliability evidence.[1,2] The fairness and accuracy of clinical assessment of medical students is critical as it informs clinical grades, Medical Student Performance Evaluation (MSPE), or "dean's letters", and—for those applying to emergency medicine (EM) residency—the Standardized Letter of Evaluation (SLOE).[3] As EM residency program directors have consistently ranked SLOEs and EM rotation grades as some of the most important criteria when offering interviews and ranking applicants,[4] ensuring fairness and accuracy in these assessments plays a paramount role in achieving equity among EM applicants.

In an effort to improve the fairness and accuracy of EM medical student assessments (and thus that of SLOEs and EM rotation grades), the National Clinical Assessment Tool for Emergency Medicine (NCAT-EM) was developed in 2016 via consensus as a standardized assessment tool.[5] This tool allowed for post-shift assessment of students by faculty or residents across six clinical performance domains: history and physical exam skills; prioritized differential diagnosis; ability to formulate a plan; observation, monitoring, and follow-up; emergency recognition and management; and patient- and team-centered communication. This tool has begun to replace institution-specific tools in numerous EM rotations across the United States,[2,5,6] and was the first nationally standardized, specialty-specific, entrustable professional activities-based assessment tool for medical students.[5]

Prior work evaluating early implementation of the NCAT-EM suggests it is achieving some of its stated goals. Specifically, Hiller et al noted high internal consistency in scores within a given institution,[6] suggesting that this tool supports reliable comparison of students within an institution during the residency application process. However, this work showcased some gaps in the validity evidence, specifically noting site-specific variation in ratings, perhaps suggesting limitations in the response process of the validity (how the raters differentially use the tool) or the generalizability of the tool.[1] Additionally, this prior work was predominantly limited to medical students in their fourth year (with a high percentage interested in EM residency), limiting generalizability. Additionally, although they found site-specific differences based on student and rater gender, they were unable to examine the association of race or ethnicity on NCAT-EM scores (despite known racial disparities in other standardized EM assessments,[7,8] such as the SLOE[9–11]). Additional work to investigate the various domains of validity of this tool would add to the literature.

Unfortunately, such disparities in assessment have been observed throughout medical education,[12] potentially contributing to the known leadership disparities and pay-based disparities based on gender and race.[13–18] Studies have identified gender- and race-based differences in language used in the MSPE[19,20] and language used in clerkship evaluations.[7,19,21] Gender- and race-based differences have also been observed through clinical grades (with lower clinical grades for non-White students, even after adjusting for variables such as scores on Step 1 of the US Medical Licensing Exam)[7,22] and overall recommendations on SLOEs.[9–11] These differences likely represent inequities, especially when the observed variations are not explained by the student performance but instead by other factors such as the clinical learning environment or the evaluator.[23,24] It is not known whether such differences persist despite the implementation of a nationally standardized tool such as the NCAT-EM.

To address this gap, our goal in this study was to analyze the association between student and rater demographics and NCAT-EM scores of clerkship students rotating through various emergency department sites at a single institution. Given prior evidence suggesting that concordance in demographics may impact ultimate evaluation,[25,26] we similarly assessed how concordance in student and rater demographics was associated with NCAT-EM scores.

Population Health Research Capsule

What do we already know about this issue?
Clinical assessment tools in medical education often show racial and sex disparities in scoring and narrative feedback.

What was the research question?
Do student and rater demographics affect National Clinical Assessment Tool for Emergency Medicine (NCAT-EM) scores in emergency medicine clerkships?

What was the major finding of the study?
Under-represented in medicine (URM) students had lower global scores (OR 0.50, 95% CI 0.25-0.99, P =.048), which was mitigated by URM rater concordance.

How does this improve population health?
Identifying disparities in clerkship assessments supports equitable evaluation, critical for building a diverse physician workforce.

METHODS

Setting and Participants

We performed a retrospective, single-center cohort study

of all electronically completed NCAT-EM assessments of clerkship medical students at the University of Pennsylvania. Individualized NCAT-EM forms were made available electronically through a Qualtrics (Qualtrics International Inc, Provo, UT) QR code. The dataset included all submitted NCAT-EM assessments from January–December 2022, as assessments completed during this year were unaffected by the COVID-19 pandemic. Given our interest in the impact of demographics on NCAT-EM scores, we excluded assessments for which demographic information (for either the student or the rater) was unavailable.

The Perelman School of Medicine curriculum includes 1.5 years of pre-clerkship content, followed by a one-year clerkship year, consisting of eight core clerkships (emergency medicine, family medicine, internal medicine, neurology, obstetrics and gynecology, pediatrics, psychiatry, and surgery) graded on an honors/high pass/pass/fail basis. During the clerkship year, students additionally complete an additional month of otolaryngology, orthopedic surgery, anesthesia, and ophthalmology (one week each, graded on a pass/fail basis). The EM clerkship is a four-week core clerkship completed at either one or two of six affiliated clinical sites.

The NCAT-EM has been used for clinical assessment of EM clerkship students in this institution since 2018. The NCAT-EM consists of six clinical performance domains rated on a four-point entrustability scale, a global assessment domain, a professionalism section, and mandatory free-text comments for strengths and suggestions for improvement (Supplemental Table 1). Students are required to present a QR code linking the NCAT-EM to attendings or EM residents during every shift, which is completed at the rater's convenience on an online platform.

During the EM clerkship, students were assigned to work 14 eight-hour shifts (or total hourly equivalent for sites with 10- or 12-hour shifts) for the duration of the clerkship. Students were required to present the QR code to at least one rater per shift (either an attending or a supervising resident ranging from postgraduate year [PGY] 2-4). The dataset did not include discrete PGY-level data for resident raters. Prior to and during this study, the clerkship directors performed annual education focused on the NCAT-EM tool and the process of assessment, which consisted of an introduction to the tool, a brief overview of the scale, and a review of medical student evaluation processes. This information session included both faculty and residents at all sites (for all individuals who would be working with students).

Data Collection and Analysis

Data collected in addition to completed NCAT-EM forms included student factors (gender and under-represented in medicine [URM] status) and rater factors (gender, URM status, and role, either resident or faculty). We extracted gender and race data for students from admissions demographics based on self-identification. For faculty, self-reported gender and race were obtained through the university's faculty affairs database. We defined URM status for both faculty and students using the Association of American Medical Colleges (AAMC) definitions. The URM status was specifically chosen as a binary variable (as opposed to race and ethnicity data), to improve power in our statistical analysis. Importantly, the definition of URM can broadly include groups that are minoritized, such as first-generation, low-income students, or students with disabilities, although for this work we used the AAMC definition of URM based on race and ethnicity. The dataset also included the quarter of year in which the student was completing the clerkship (block 1, 2, 3, or 4), and the clinical site where they were rotating. All data were deidentified prior to data analysis.

We performed univariate ordinal logistic regression analyses to determine the association between the global assessment on the NCAT-EM tool (bottom third, middle third, top third, or top 10%), with student gender, student URM status, faculty gender, faculty URM status, clerkship site, and rotation block. We then performed mixed-effect ordinal logistic regression analyses to determine the association between NCAT-EM scores and student gender, clustered by student, after adjusting for site of rotation, time, role of rater, student URM status, and rater demographics (gender, URM status). To assess the association with URM status, we performed mixed-effect ordinal logistic regression analyses to determine the association between NCAT-EM scores and student URM status, clustered by student, after adjusting for site of rotation, block, role of rater, student gender, and rater demographics. Given the hypothesis that concordance in rater gender and student gender and URM status might be associated with NCAT-EM scores, we also assessed the interaction between student gender and rater gender, and student URM status and rater URM status.

For each analysis, the model was clustered on student (random effects) and rater (random effects). This model was used intentionally to adjust for the non-independent nature of students and/or raters throughout the dataset, as this model provides adjusted standard errors accounting for student and/or rater clustering (random effects) throughout the dataset. Based on prior factor analyses showing each domain in the NCAT-EM assessed unique domains, we repeated the above analysis for each of the six clinical performance domains of the assessment. (See Supplemental Table 1 for the NCAT-EM domains.)

While our primary analysis included URM (as per AAMC definition) as a binary variable, we aimed to further understand our findings in the context of URM categories, recognizing that URM individuals who spanned different identities might have had different experiences with assessment. Thus, we performed a sensitivity analysis using racial and ethnic groups within the AAMC definition of URM (African- American/Black, Hispanic/Latino, Native American, including American Indian, Alaska Native, and Native

Hawaiian, Pacific Islander, and mainland Puerto Rican). We then performed a second sensitivity analysis comparing individuals identifying as Black compared to other individuals (noting the large proportion of individuals within the cohort identifying as URM were Black and the distinct experiences of this population[27,28]).

We completed statistical analysis using STATA v18.0 (StataCorp, LLC, College Station, TX). Statistical significance was determined using a *P*-value of .05 (not adjusting for multiple comparisons given the exploratory nature of the analysis, to reduce the risk of type 2 error). This study was deemed exempt by the University of Pennsylvania Institutional Review Board.

RESULTS

Over the course of 2022, 1,881 complete NCAT-EM assessment forms were submitted on 142 distinct students (consisting of 74 women [52%] and 68 men [48%], including 34 [24%) who identified as URM) completed by 266 different raters. We excluded 122 NCAT-EM forms prior to analysis, due to incomplete demographic information for the rater. The median number of completed forms per student was 13 [(IQR 11- 15), which was similar between genders (13.4 for men vs 13.1 for women, $P = .59$). There were fewer NCAT-EM assessments completed on those who identified as URM within the sample (with a mean of 11.8 vs 13.8 assessments for non-URM students, $P = .01$). Most assessments were completed by raters who identified as men ($n = 1,070$, 60%), and 11% ($n = 195$) were completed by raters who identified as URM. The racial demographics of faculty identified as URM (as per AAMC definitions) was 119 (61%) Black, 55 (28%) Hispanic or Latino, and 21 (11%) Pacific Islander. The racial demographics of students identified as URM (as per AAMC definitions) was 224 (56%) Black, 38 (10%) Hispanic or Latino, and 138 (35%) spanning multiple groups. Complete demographic information of completed NCAT-EM forms are included in Table 1.

Distribution of scores for each of the six clinical performance domains on the NCAT-EM as well as the global assessment domain (see Supplemental Table 1) are summarized in Table 2. Global assessment scores were skewed leftward (consistent with prior national data[5]), with 38 ratings (2.1) ratings representing the lower third in the global assessment, 506 (28%) in the middle third, 878 (49%) in the upper third, and 387 (21%) in the top 10% ("exceptional").

The results of the univariate ordinal logistic regression are shown in Table 3. In the univariate analysis, there was a significant association based on rater role, with faculty raters being less likely to rate students in the higher entrustment scores compared to resident raters for all domains ($P < .001$ for all domains); thus, this was included in the multivariate analysis. There was also an association between rotation block and NCAT-EM scores, and site of the rotation and NCAT-EM scores; thus, these variables were included in the final regression model.

Table 1. Student characteristics, rater characteristics, clinical site and block of completed NCAT-EM assessment forms.

Characteristic	Completed NCAT-EM forms (n, %)
Student gender	1881 (100.0%)
Men	913 (48.5%)
Women	968 (51.5%)
Student URM status	1881 (100.0%)
URM	400 (21.3%)
African American/Black	224 (56%)
Hispanic/Latino	38 (10%)
Multiple AAMC URM Groups	138 (35%)
Non-URM	1481 (78.7%)
Rater Role	1775 (100.0%)
Resident	484 (27.3%)
Faculty	1291 (72.7%)
Rater Gender	1783 (100.0%)
Men	1070 (60.0%)
Women	713 (40.0%)
Rater URM Status	1759 (100.0%)
URM	195 (11.1%)
African American/Black	119 (61%)
Hispanic/Latino	55 (28%)
Pacific Islanders	21 (11%)
Non-URM	1564 (88.9%)
Clinical Site	1880 (100.0%)
Quaternary care site	694 (36.9%)
Community site A	662 (35.2%)
Community site B	187 (9.9%)
Community site C	129 (6.9%)
Pediatric site	121 (6.4%)
Veteran's Affairs	87 (4.6%)
Block	1881 (100.0%)
1	569 (30.2%)
2	569 (30.2%)
3	305 (16.2%)
4	438 (23.3%)

All results are expressed as number of NCAT assessment forms completed within each category, followed by percent of assessments for which data are available.
NCAT-EM, National Clinical Assessment Tool for Emergency Medicine; *URM*, under-represented in medicine; *AAMC,* Association of American Medical Colleges.

The results of the multivariate ordinal logistic regression, clustered by student and rater, are shown in Table 4, using a significant threshold of $P = .05$ (rather than adjusting for

Table 2. Overview of ratings for National Clinical Assessment Tool for Emergency Medicine clinical performance domains and global assessment.

NCAT-EM Domain	n (%)
Focused history and physical exam skills	1,879 (100%)
Unable to assess	25 (1%)
Pre-entrustable	118 (6%)
Mostly entrustable	742 (40%)
Fully entrustable/Milestone 1	754 (40%)
Outstanding/Milestone 2	240 (13%)
Ability to generate a prioritized differential diagnosis	1,866 (100%)
Unable to assess	31 (2%)
Pre-entrustable	152 (8%)
Mostly entrustable	818 (44%)
Fully entrustable/Milestone 1	664 (36%)
Outstanding/Milestone 2	201 (11%)
Ability to formulate plan (diagnostic, therapeutic, disposition)	1,861 (100%)
Unable to assess	34 (2%)
Pre-entrustable	163 (9%)
Mostly entrustable	894 (48%)
Fully entrustable/Milestone 1	592 (32%)
Outstanding/Milestone 2	178 (10%)
Observation, monitoring, and follow-up	1,861 (100%)
Unable to assess	42 (2%)
Pre-entrustable	120 (6%)
Mostly entrustable	683 (37%)
Fully entrustable/Milestone 1	747 (40%)
Outstanding/Milestone 2	263 (14%)
Emergency recognition and management	1,851 (100%)
Unable to assess	385 (21%)
Pre-entrustable	98 (5%)
Mostly entrustable	673 (36%)
Fully entrustable/Milestone 1	523 (28%)
Outstanding/Milestone 2	172 (9%)
Patient- and team-centered communication	1,848 (100%)
Unable to assess	40 (2%)
Pre-entrustable	65 (4%)
Mostly entrustable	605 (33%)
Fully entrustable/Milestone 1	794 (43%)
Outstanding/Milestone 2	344 (19%)
Global assessment	1,809 (100%)
Lower third	38 (2%)
Middle third	506 (28%)
Top third	878 (49%)
Exceptional (top 10%)	387 (21%)

All results are expressed as number of NCAT-EM assessment forms completed within each category, followed by percentage of assessments for which data are available.
NCAT-EM, National Clinical Assessment Tool for Emergency Medicine.

multiple comparison due to the exploratory nature of the study). As there was no significant interaction between the student gender and rater gender in each analysis, this interaction term was excluded from the final regression model. The final regression model included the rater gender and student gender, rater and student URM status (and the interaction between them), rater role (faculty vs resident), clinical site, and rotation block. The results of the mixed regression identified no significant associations between student gender and NCAT-EM scores for each NCAT-EM domain (Table 4). There was a significant interaction effect between student gender and rater gender in the domain of history and physical exam (OR 0.31, CI 0.11-0.83, $P = .02$). There were no other significant interaction effects in the remainder of the domains.

Student URM status was associated with lower scores for the global assessment, (OR 0.50, CI 0.25-0.99, $P = .05$), history/physical exam domain (OR 0.38, CI 0.19-0.77, $P = .01$) and the prioritized differential diagnosis domain (OR 0.47, CI 0.26-0.88, $P = .02$) after multivariate adjustment, as shown in Table 4. These findings were moderated by a significant positive interaction effect between student and rater URM status in the observation/monitoring domain (OR 4.55, CI 1.21-17.1, $P = .03$), suggesting that concordance in URM status between raters and students lessened (and in some instances, reversed) the negative effect of URM status on NCAT-EM scores. More specifically, when assessing the significant domains for a given student, the adjusted ORs for URM-concordant dyads were adjusted OR 0.83 for the global assessment (suggesting the difference persisted); adjusted OR 1.06 for history/physical domains; and adjusted OR 1.76 for observation/monitoring (suggesting reversal of the score, and URM-concordant dyads had higher odds of receiving a higher score than the reference cohort).

The sensitivity analysis using racial and ethnic groups within the URM status (Black, Hispanic/Latino, Native Americans, including American Indians, Alaska Natives, and Native Hawaiians, Pacific Islanders, and mainland Puerto Ricans demonstrated a poorer fit to the data—based on likelihood ratio tests and Bayesian information criterion and Akaike's information criterion comparisons—than the original model. As this approach risked underestimating the true effect, it was not included in the results. In our sensitivity analysis comparing individuals who were Black to other individuals in the cohort, we found significant associations with NCAT-EM ratings in the domains of history/physical domain (OR 0.32, CI 0.14-0.76, $P = .01$); prioritized differential domain (OR 0.36, CI 0.17-0.79, $P = .01$); the ability to formulate a plan domain (OR 0.46, CI 0.59-1.48, $P = .05$), with significant interaction effects noted in the majority of domains. (See Table 5 for full details.)

DISCUSSION

Our study demonstrates important associations between both rater and student demographics and NCAT-EM scores

Table 3. Univariate associations between ratings for National Clinical Assessment Tool for Emergency Medicine domains and student and rater characteristics.

	Global Assessment		History/ Physical		Prioritized Differential		Ability to Formulate Plan		Observation/ Monitoring		Emergency Management		Communication	
Variable	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Student gender														
Men	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-
Women	0.91 (0.77, 1.08)	.30	0.85 (0.72, 1.01)	.06	0.91 (0.77, 1.08)	.30	0.90 (0.76, 1.07)	.24	0. 97 (0.83, 1.15)	.75	1.05 (0.88, 1.26)	.59	0.97 (0.82, 1.15)	.73
Student URM-status														
Non-URM	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-
URM	0.91 (0.73, 1.12)	.37	0.90 (0.73, 1.11)	.23	0.92 (0.75, 1.14)	.45	0.67 (0.37-1.22)	.19	1.00 (0.81, 1.23)	.99	.99 (0.81, 1.21)	.93	1.11 (0.90, 1.36)	.33
Rater role														
Resident	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-
Faculty	0.46 (0.38, 0.57)	< .001	0.34 (0.28, 0.42)	< .001	0.29 (0.24, 0.36)	<.001	0.38 (0.31, 0.46)	< .001	0.32 (0.27, 0.40)	< .001	0.43 (0.35, 0.53)	<0.001	0.19 (0.15, 0.24)	< .001
Rater gender														
Men	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-
Women	1.05 (0.88, 1.26)	.60	1.26 (1.06, 1.51)	.01	1.21 (1.01, 1.44)	.04	1.21 (1.02, 1.45)	.03	1.24 (1.04, 1.48)	0.02	0.86 (0.72, 1.02)	0.09	1.04 (0.87, 1.24)	.65
Rater URM-status														
Non-URM	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-
URM	0.67 (0.53, 0.93)	.02	1.14 (0.87, 1.50)	.33	1.23 (0.93, 1.61)	.13	1.29 (0.97, 1.69)	.08	1.37 (1.04, 1.79)	.02	0.95 (0.72, 1.26)	.74	1.08 (0.82, 1.43)	.58

OR, odds ratio; *NCAT-EM,* National Clinical Assessment Tool for Emergency Medicine; *URM,* under-represented in medicine.

within our cohort, with notable findings based on student URM status. Our multivariate analysis did not find any gender-related differences in NCAT-EM domains. However, the multivariate analysis showed that students identified as URM received lower NCAT-EM scores in several domains, including the history/physical exam domain and the prioritized differential diagnosis domain. This effect was mediated (and in some cases reversed) by concordance of URM status between raters and students in some of the domains, such that concordance in URM status between students and raters was associated with higher NCAT-EM scores.

The association between student URM status with lower NCAT-EM scores is consistent with prior literature documenting longstanding racial disparities in clerkship grading.[21,29,30] Despite the NCAT-EM being noted to have excellent internal consistency based on prior studies,[6] this suggests that the use of the tool continues to be impacted by its differential use by raters and raises some concern about additional domains of validity with the tool.[1] It is important for us as medical educators to ensure the assessment tool widely used to guide clerkship grading does not introduce any construct irrelevance variance at all.[31,32]

In this study, the observed score differences by URM status may be the result of implicit bias of raters affecting both their global perception and perception of competency-related behaviors of students, lack of mentorship leading to

Table 4. Multivariate associations between ratings for National Clinical Assessment Tool for Emergency Medicine domains and student sex and under-represented in medicine (URM) status, after adjusting for rater sex and URM status, concordance of student-rater URM status, clinical site, and time.

	Global assessment		History/ physical		Prioritized differential		Ability to formulate plan		Observation/ monitoring		Emergency management		Communication	
Variable	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Student Sex														
Men	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-
Women	0.93 (0.54, 1.60)	.78	0.84 (0.50, 1.42)	.52	0.98 (0.61, 1.57)	.93	0.95 (0.60, 1.51)	.84	1.26 (0.84, 1.89)	.26	0.87 (0.60, 1.27)	.48	1.21 (0.82, 1.78)	.35
Interaction between rater and student gender														
Sex concordance between men	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-
Sex concordance between women	0.74 (0.49, 1.09)	.13	0.59 (0.40, 0.85)	.006	0.87 (0.60, 1.27)	.48	0.76 (0.52, 1.11)	0.16	0.96 0.66, 1.40)	.83	0.90 (0.62, 1.29)	.56	1.02 (0.70, 1.28)	.93
Student URM Status														
Non-URM	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-
URM	0.50 (0.25, 0.99)	.006	0.38 (0.19, 0.77)	.007	0.47 (0.26, 0.88)	.02	0.67 (0.37, 1.22)	.19	0.62 (0.37, 1.06)	.08	0.78 (0.60, 1.27)	.34	0.78 (0.47, 1.30)	.35
Interaction between rater and student URM-status														
Non-URM concordance	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-
URM concordance	2.92 (0.70, 12.23)	.14	3.97 (0.74, 21.30)	.11	4.38 (0.99, 19.35)	.05	3.47 (0.72, 16.64)	.12	4.56 (1.21, 17.09)	.03	1.28 (0.33, 4.93)	.72	2.60 (0.65, 10.41)	.18

OR, odds ratio; *NCAT-EM,* National Clinical Assessment Tool for Emergency Medicine; *URM,* under-represented in medicine.

Table 5. Multivariate associations between ratings for National Clinical Assessment Tool for Emergency Medicine domains and Black vs non-Black race, after adjusting for rater sex and race (Black vs non-Black), concordance of student-rater race, clinical site, and time.

	Global assessment		History/physical		Prioritized differential		Ability to formulate plan		Observation/ monitoring		Emergency management		Communication	
Variable	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Student Race														
Non-Black	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-	1.0 (ref)	-
Black	0.67 (0.28, 1.62)	.38	0.32 (0.14, 0.76)	.01	0.36 (0.17, 0.79)	.01	0.46 (0.59, 1.48)	.05	0.54 (0.28, 1.04)	.07	0.78 (0.42, 1.44)	.42	0.65 (0.34, 1.24)	.20
Interaction between Black Raters and Black Students	25.8 (3.23, 205.1)	.002	39.4 (3.42, 452.5)	.003	38.9 (4.56, 331.4)	.001	32.9 (3.40, 317.43)	.003	29.37 (4.55, 189.46)	<.001	2.07 (0.31, 13.9)	.45	17.59 (2.29, 135.41)	.006

OR, odds ratio; *NCAT-EM,* National Clinical Assessment Tool for Emergency Medicine.

inequitable opportunities, or different lived experiences of URM students impacting their experience, and performance in the clinical environment (including stereotype threat, microaggressions, patient mistreatment, being tasked with being a racial ambassador, unrewarded labor, limited resources, and othering).[17,21,33–35] The complexity of this amalgam of factors that exacerbates disparities in clerkship grading has been described as the "social milieu of medical education,"[35] and may ultimately contribute to the inequities observed in other standardized assessments used in EM, such as the SLOE. Improved understanding of these disparities in the EM clerkship setting and further evaluation of the validity evidence of the NCAT-EM tool is critical to identify solutions to mitigate these issues.

Perhaps more interestingly, some of the findings of a differential score based on URM status were mitigated (and in some cases, reversed) by URM concordance between the student and rater, specifically within the prioritization of a differential, and the observation and monitoring domains. As a possible explanation, URM concordance may reduce implicit bias of the rater as well as the other effects of racism on the medical student, such as stereotype threat. Concordance between the rater and student can also enhance performance of the student through the role-model effect.[33] This aligns with prior studies that have shown the importance of racial concordance in multiple domains, including patient care, professional development,[17] and medical education assessment,[36,37] further highlighting the critical nature of supporting equity initiatives to advanced diversity across EM faculty and residents.

It is not clear why this phenomenon would be present for only two of the NCAT-EM domains, although it could represent something unique about those domains, including that they may capture more direct interaction between students and raters (such as prioritizing differentials) and, thus, concordance would be more heavily impacted. Regardless, this further suggests that additional robust validity studies of the NCAT-EM tool are needed. Additionally, while we noted various impacts of URM concordance on the NCAT-EM scores, the impact on the overall disparities identified in our study may be negligible, and further work is needed to examine this phenomenon across a larger sample of more diverse learners and raters.

Another interesting observation within our study was that URM students had fewer submitted NCAT-EM forms in the full cohort, which persisted after adjusting for minor site differences. The structure of the NCAT-EM within our institution requires learners to seek out designated feedback and collect assessments via a QR code. This difference could indicate differences in self-promotion behavior,[38] which may uniquely disadvantage URM students. Specifically, there is a complex interplay between evaluations, biases, and the associated impact on confidence, self-esteem, and motivation. In URM students, negative evaluations, even if biased, may reinforce stereotype threat—defined as a fear of confirming negative stereotypes about their group—[17] and ultimately hinder professional growth. Understanding this, as well as other unique barriers to seeking evaluation by URM students as observed in this study, should be further evaluated.

We also found no difference in NCAT-EM scores based on gender, with no significant difference in scores between men and women in the cohort. This absence of gender associations across the NCAT-EM performance domains was surprising, and in contrast to prior work analyzing the NCAT-EM in medical students. Specifically, in a study by Hiller and colleagues, there were student gender-based differences in composite NCAT-EM scores at 4 of the 13 sites included in their study.[6] However, this prior work was conducted with limited demographic data and an over-representation of male students, with predominantly students in their final year of medical school. It is possible that gender disparities across diverse assessment domains become apparent at later stages in training (as has been observed in residency assessments).[39,40]

As NCAT-EM scores inform clinical grades, and subsequently the SLOE and MSPE, it is critical to mitigate disparities in use of the NCAT-EM tool as found in our study. The NCAT-EM has features of prior recommendations to reduce grading inequity, including workplace-based assessment, criterion-based rubrics, and competency-based grading. Our data show that rating disparities are still present, despite high internal consistency metrics of the NCAT-EM. This argues that the tool itself does not contribute to disparities, but real-world use of the tool by raters contributes to these differences. Ultimately, the scoring differences found in our study support the use of rater training, which has been shown to improve the accuracy of workplace-based entrustment ratings of medical learners.[41]

Additionally, ongoing efforts to promote an equitable and diverse workforce are necessary, noting the role of concordance on some of these disparities. Ultimately, achieving fairness and accuracy in NCAT-EM assessments is crucial to promoting gender and racial equity among EM applicants, especially with national implementation of the NCAT-EM tool. In addition, clerkships in other specialties should note that despite the positive impacts of using a standardized and national assessment instrument with strong reliability, testing by itself is not the solution for overcoming observed differences not explained by student performance.

LIMITATIONS

Although we identified compelling findings, this study had several limitations. Our study analytic approach involved multiple regressions, and we did not adjust for multiple comparisons due to the exploratory nature of the study, which increased the risk of type 1 error in our conclusions. However, we feel the presence of findings in our sensitivity analysis suggests that this finding is a true trend. In addition, the study

was limited to a single institution. Although it included six different sites within the institution (each with a unique culture and patient population), obtaining a multicenter study across distinct geographical regions is an important next step to fully evaluate the effect of student and rater demographics on NCAT-EM performance nationally. Furthermore, it is not yet clear whether these findings among second- and third-year clerkship students can be generalized to more senior medical students on sub-internships or electives, and additional work evaluating the impact of URM status on advanced students is needed. Our study did not include individuals who identified as gender diverse, which would also be important to include in future research. Finally, while we importantly noted some differences in NCAT-EM use by site and by level (residents NCAT-EM scores were higher as compared to faculty), we were unable to assess PGY level in residency training nor the impact of faculty development on the tool. This is an important area of future work.

CONCLUSION

While we found no association between student gender with NCAT-EM scores, we did find an association between student under-represented in medicine status in two of six NCAT-EM performance domains, an effect that was mediated by concordance in URM status with the rater. Future multi-institution research is needed to verify grading disparities based on student and rater characteristics on the national level, which would further support the use of multifaceted interventions to mitigate disparities in ratings, including diversity efforts in recruitment practices, equitable access to medical school resources, gender- or URM-specific student support and rater training to ultimately promote equity among emergency physicians.

Address for Correspondence: Janae K. Heath, MD, MSCE, Hospital of the University of Pennsylvania, Department of Medicine, 3600 Spruce St, 822 West Gates Building, Philadelphia, PA 19104. Email: Janae.heath@pennmedicine.upenn.edu

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Amin et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Cook DA, Beckman TJ. Current concepts in validity and reliability for psychometric instruments: theory and application. *Am J Med*. 2006;119(2):166.e7-16.
2. Lawson L, Jung J, Franzen D, et al. Clinical assessment of medical students in emergency medicine clerkships: a survey of current practice. *J Emerg Med*. 2016;51(6):705-11.
3. Negaard M, Assimacopoulos E, Harland K, et al. Emergency medicine residency selection criteria: an update and comparison. *AEM Educ Train*. 2018;2(2):146-153.
4. Katzung KG, Ankel F, Clark M, et al. What do program directors look for in an applicant? *J Emerg Med*. 2019;56(5):e95-101.
5. Jung J, Franzen D, Lawson L, et al. The National Clinical Assessment Tool for Medical Students in the emergency department (NCAT-EM). *West J Emerg Med*. 2018;19(1):66-74.
6. Hiller K, Jung J, Lawson L, et al. Multi-institutional implementation of the national clinical assessment tool in emergency medicine: data from the first year of use. *AEM Educ Train*. 2021;5(2):e10496.
7. Gauer JL, Mustapha T, Violato C. Race and gender bias in clerkship grading. *Teach Learn Med*. 2024;36(3):304-11.
8. Nguemeni Tiako MJ, Ray V, South EC. Medical schools as racialized organizations: how race-neutral structures sustain racial inequality in medical education—a narrative review. *J Gen Intern Med*. 2022;37(9):2259-66.
9. Winfield A, Amin DP. To the Editor: Where Is equity in the SLOE? *J Grad Med Educ*. 2022;14(3):357.
10. Calles I. To the Editor: For equity in assessment: a comment on bias in the emergency medicine Standardized Letter of Evaluation. *J Grad Med Educ*. 2023;15(1):129.
11. Kukulski P, Ahn J. Validity evidence for the emergency medicine Standardized Letter of Evaluation. *J Grad Med Educ*. 2021;13(4):490-9.
12. Colson ER, Pérez M, Blaylock L, et al. Washington University School of Medicine in St. Louis Case Study: A Process for Understanding and Addressing Bias in Clerkship Grading. *Acad* Med. 2020 Dec;95(12S Addressing Harmful Bias and Eliminating Discrimination in Health Professions Learning Environments):S131-5.
13. Cheng D, Promes S, Clem K, et al. Chairperson and faculty gender in academic emergency medicine departments. *Acad Emerg Med*. 2006;13(8):904-6.
14. Madsen TE, Linden JA, Rounds K, et al. Current status of gender and racial/ethnic disparities among academic emergency medicine physicians. *Acad Emerg Med*. 2017;24(10):1182-92.
15. Wiler JL, Wendel SK, Rounds K, et al. Salary disparities based on gender in academic emergency medicine leadership. *Acad Emerg Med*. 2022;29(3):286-93.
16. Jena AB, Khullar D, Ho O, et al. Sex differences in academic rank in US medical schools in 2014. *JAMA*. 2015;314(11):1149-58.
17. Bullock JL, Lockspeiser T, Del Pino-Jones A, et al. They don't see a lot of people my color: a mixed methods study of racial/ethnic stereotype threat among medical students on core clerkships. *Acad Med*. 2020;95(11S Association of American Medical Colleges Learn Serve Lead: Proceedings of the 59th Annual Research in Medical Education Presentations):S58-S66.
18. Ackerman-Barger K, Boatright D, Gonzalez-Colaso R, et al. Seeking

inclusion excellence: understanding racial microaggressions as experienced by underrepresented medical and nursing students. *Acad Med*. 2020;95(5):758-63.
19. Ross DA, Boatright D, Nunez-Smith M, et al. Differences in words used to describe racial and gender groups in Medical Student Performance Evaluations. *PLoS ONE*. 2017;12(8):e0181659.
20. Axelson RD, Solow CM, Ferguson KJ, et al. Assessing implicit gender bias in Medical Student Performance Evaluations. *Eval Health Prof*. 2010;33(3):365-85.
21. Hanson JL, Pérez M, Mason HRC, et al. Racial/ethnic disparities in clerkship grading: perspectives of students and teachers. *Acad Med*. 2022;97(11S):S35-S45.
22. O'Sullivan L, Kagabo W, Prasad N, et al. Racial and ethnic bias in medical school clinical grading: a review. *J Surg Educ*. 2023;80(6):806-16.
23. Lucey CR, Hauer KE, Boatright D, et al. Medical education's wicked problem: achieving equity in assessment for medical learners. *Acad Med*. 2020;95(12S Addressing Harmful Bias and Eliminating Discrimination in Health Professions Learning Environments):S98-S108.
24. Kakara Anderson HL, Govaerts M, et al. Clarifying and expanding equity in assessment by considering three orientations: Fairness, inclusion and justice. *Med Educ*. 2025;59(5):494-502.
25. Takeshita J, Wang S, Loren AW, et al. Association of racial/ethnic and gender concordance between patients and physicians with patient experience ratings. *JAMA Netw Open*. 2020;3(11):e2024583.
26. McOwen KS, Bellini LM, Guerra CE, et al. Evaluation of clinical faculty: gender and minority implications. *Acad Med*. 2007;82(10):S94.
27. Nguemeni Tiako MJ, Wages JE 3rd, Perry SP. Black medical students' sense of belonging and confidence in scholastic abilities at historically Black vs predominantly White medical schools: a prospective study. *J Gen Intern Med.* 2023 Jan;38(1):122-4.
28. Ghanem N, Goldberg DG, Granger E, et al. A critical qualitative study to understand current Black women medical student perspectives on anti-racist reform in US medical education. *Med Educ Online.* 2024;29(1):2393436.
29. Boatright D, Anderson N, Kim JG, et al. Racial and ethnic differences in internal medicine residency assessments. *JAMA Netw Open*. 2022;5(12):e2247649.
30. Low D, Pollack SW, Liao ZC, et al. Racial/ethnic disparities in clinical grading in medical school. *Teach Learn Med*. 2019;31(5):487-96.
31. Downing SM. Threats to the validity of locally developed multiple-choice tests in medical education: construct-irrelevant variance and construct underrepresentation. *Adv Health Sci Educ Theory Pract*. 2002;7(3):235-41.
32. Tavakol M, Dennick R. The foundations of measurement and assessment in medical education. *Med Teach*. 2017;39(10):1010-5.
33. Wheeler M, de Bourmont S, Paul-Emile K, et al. Physician and trainee experiences with patient bias. *JAMA Intern Med*. 2019;179(12):1678-85.
34. Colson ER, Pérez M, Chibueze S, et al. Understanding and addressing bias in grading: progress at Washington University School of Medicine. *Acad Med.* 2023;98(8S):S64.
35. Osseo-Asare A, Balasuriya L, Huot SJ, et al. Minority resident physicians' views on the role of race/ethnicity in their training experiences in the workplace. *JAMA Netw Open*. 2018;1(5):e182723.
36. Heath JK, Dine CJ, LaMarra D, et al. The impact of trainee and standardized patient race and gender on internal medicine resident communication assessment scores. *J Grad Med Educ.* 2021;13(5):643-9.
37. Berg K, Blatt B, Lopreiato J, et al. Standardized patient assessment of medical student empathy: ethnicity and gender effects in a multi-institutional study. *Acad Med*. 2015;90(1):105-11.
38. Pololi L, Conrad P, Knight S, et al. A Study of the relational aspects of the culture of academic medicine. *Acad Med*. 2009;84(1):106.
39. Dayal A, O'Connor DM, Qadri U, et al. Comparison of male vs female resident milestone evaluations by faculty during emergency medicine residency training. *JAMA Intern Med*. 2017;177(5):651-7.
40. Santen SA, Yamazaki K, Holmboe ES, et al. Comparison of male and female resident milestone assessments during emergency medicine residency training: a national study. *Acad Med*. 2020;95(2):263.
41. Kogan JR, Dine CJ, Conforti LN, et al. Can rater training improve the quality and accuracy of workplace-based assessment narrative comments and entrustment ratings? A randomized controlled trial. *Acad Med*. 2023;98(2):237-47.

Program Director Perspectives on the Impact of the Proposed 48-Month Emergency Medicine Residency Requirement: A National Survey

Richard Austin, MD*
Chinmay Patel, DO†
Kristin Delfino, PhD‡
Sharon Kim, PhD*

*Southern Illinois University, School of Medicine, Department of Emergency Medicine, Springfield, Illinois
†Baylor Scott & White All Saints Medical Center, Department of Emergency Medicine, Fort Worth, Texas
‡Southern Illinois University, School of Medicine, Department of Surgery, Springfield, Illinois

Section Editor: Kendra Parekh, MD, MHPE
Submission history: Submitted June 2, 2025; Revision received October 15, 2025; Accepted October 15, 2025
Electronically published November 26, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI 10.5811/westjem.48359

Introduction: In early 2025, the Accreditation Council for Graduate Medical Education (ACGME) announced proposed revisions to emergency medicine (EM) residency training to include substantial changes to the length of training programs, required rotations, and structured experiences. To date, no published national survey has sought to determine how these changes would impact individual programs.

Methods: Over a three-week period in April 2025, we anonymously surveyed program directors or their designees online through the Council of Residency Directors in Emergency Medicine listserv. Survey respondents were asked about the impact the changes would have on their programs and their overall opinions of the proposed 48-month minimum requirement.

Results: A total of 86 program directors responded to the survey (response rate of 29.9%) with representative samples from current three-year (83.7%, 72/86) and four-year (16.3%, 14/86) programs. Most program directors reported that they would have to make significant revisions in either structured experiences, required rotations, or both. Most survey respondents from three-year programs (52/72) do not support the proposed changes, whereas all respondents from four-year programs (14/14) do support the changes (P<.001).

Conclusion: Proposed program requirements may require modifications in both three- and four-year programs; 33 of the 86 program directors surveyed reported that would need more than one year to meet the requirements, if adopted. This raises the concern that programs may not be prepared to implement the revisions within the proposed timeline, potentially impacting resident education and the future EM workforce. The ACGME should consider a staged rollout of requirements to allow them to be thoughtfully implemented in a meaningful way. [West J Emerg Med. 2025;26(6)1504–1509.]

INTRODUCTION

On February 12, 2025, the Accreditation Council for Graduate Medical Education (ACGME) proposed significant revisions to the program requirements for emergency medicine (EM) residency training in the United States, with the most notable change being the standardization of training length to 48 months for all programs, effective July 1, 2027.[1] This proposed change has generated considerable discussion and debate within the EM community, with concerns raised about its potential impact on resident education, program finances, and the EM workforce. Currently, most programs are three years in length, with four-year programs comprising less than 25% of EM residency programs in the US.[2]

Approximately 60% of EM program directors (PD) (173/289) from the ACGME database completed a survey created by the Program Requirements Writing Group 3, which

found that summed averages for necessary experiences were 41.6 months for three-year programs and 50.7 months for four-year programs. This survey has subsequently been used as justification for the proposed new program requirements, including the 48-month minimum program length. However, the survey did not specifically ask about support for a change from three to four years of training, and it was not designed to examine the impact of any potential changes. The ACGME's rationale for this change includes concerns about declining board pass rates, potentially attributed to shorter EM shifts and fewer patient encounters during training.[4] Yet the available published data show that graduates of three- and four-year programs perform similarly in clinical practice and on board pass rates. [5,6]

To further explore the perceived challenges and opportunities associated with this change, we surveyed EM PDs on the changes that would be required within their programs and anticipated challenges with the new requirements, and we gauged their support for the proposed requirement of 48 months of training for all EM programs.

Population Health Research Capsule

What do we already know about this issue?
The ACGME has proposed major changes to emergency medicine (EM) training.

What was the research question?
How do program directors view the proposed ACGME changes and what resources are needed to comply?

What was the major finding of the study?
33.6% of 3-year and 100% of 4-year programs support the change to 48 months minimum residency training in emergency medicine ($P < .001$).

How does this improve population health?
The study identifies changes that EM programs would need to implement meet new standards, to ensure the future workforce is well-prepared to deliver quality care.

METHODS

We conducted a national cross-sectional survey of EM PDs, or their selected designees (defined as a faculty member delegated by the PD or other residency leadership), from ACGME-accredited EM residency programs in the US over a three-week period in April 2025. After we developed the survey instrument it was piloted for content validity, clarity, and relevance by four members of our educational leadership teams who have experience in program leadership and survey-based research. All feedback was incorporated into the survey, which was approved by our institutional review board as an exempt study. The survey was designed on SurveyMonkey (Momentive Inc., San Mateo, CA) and disseminated to EM PDs through the Council of Residency Directors (CORD) in Emergency Medicine Program Director list-serv. Reminders were sent at one-week intervals for a total of three times. At the time of the study there were 288 PDs in ACGME-accredited EM programs.

The survey (Appendix A) consisted of 11 questions and was divided into three sections: demographic information; curricular changes; and reflection. In the section on proposed curricular changes, participants were asked to assume that the program requirements had been adopted and to answer questions on anticipated changes to their program's required rotations (62 weeks at primary emergency department [ED], low-resource ED, high-resource ED, low-acuity area, critical care, pediatric intensive care unit, pediatric ED, administration/quality assurance, toxicology/addiction medicine, and emergency medical services). They were then asked about anticipated changes that would be necessary to meet the required structured experiences (non-laboratory diagnostics such as ultrasound, telemedicine, primary assessment and decision-making, airway management, ophthalmologic procedures, acute psychiatric emergencies, sensitive exams, transitions of care, and observation medicine). The final section of the survey included questions on the time needed to adopt the 48-month format, additional resources required (additional funding aside from salary, additional training sites, additional core faculty, additional clinical faculty, more protected time, additional simulation or procedure lab time), and agreement on the proposed changes.

We summarized categorical survey responses with frequencies and percentages. Chi-square tests were used to evaluate associations. *P*-values < .05 were considered statistically significant. We performed analysis using SAS v9.4 (SAS Institute Inc, Cary, NC).

RESULTS

A total of 92 respondents completed the survey. However, six were excluded because they did not identify as either a PD or their designee, and their data was not included in the analysis. In total, 86 EM programs were included in the analysis of the survey data for a final response rate of 29.9%. Of the 86 PDs who completed the survey, 72 (83.7%) were from three-year programs and 14 (16.3%) from four-year programs, which is similar to the breakdown of three- and four-year programs currently listed on the Emergency Medicine Residents' Association Match website.[7] Most programs were university-based (33, 38.4%), followed

by community-based university-affiliated (31, 36%), and community-based (22, 25.6%). Participant programs were geographically representative (Table) of the EM academic community based on Fellowship and Residency Electronic Interactive Database Access geographic regions.[7]

Curriculum Changes

Of the 86 PDs who responded to the survey, 50 (58%) anticipated needing to make three or more changes to their curricula to meet the required nine structured experiences (Table). This was not significantly different between three- and four-year programs. Of the 86 respondents, 14 (16%) reported already having all the required rotations in the proposed requirements, and 34 (40%) reported that they would need to add three or more rotations. Forty-four respondents (51.2%) indicated that they would be likely to increase their complement of residents, whereas 12 (14%) indicated that they would likely decrease the number of residents. Twenty-five respondents (29.1%) indicated that they were unlikely to change their complement, and five respondents (5.8%) did not answer the question. Most of the programs that would look to expand their complement were currently three-year programs (42/44, 95.5%).

Time Needed

Forty-nine (57%) PDs indicated readiness for all the changes within a one-year period, while 33 (38.4%) reported they would require more than one year to prepare, 20 (23%)

Table. Survey results comparing three- and four-year programs by demographic region, program type, time required to implement changes, additional resources required to implement changes, agreement on 48 months of training, total changes needed in experiences, and total changes needed in rotations.

	Frequency (N = 86)	Percentage	3 years (n = 72)		4 years (n = 14)		P-value
What geographic region is your program in (as listed in FRIEDA)?							
East North Central (IL, IN, MI, OH, WI)	15	17.4%	13	18.1%	2	14.3%	
East South Central (AL, KY, MS, TN)	2	2.3%	2	2.8%	0	0.0%	
Mid Atlantic (NJ, NY, PA)	22	25.6%	18	25.0%	4	28.6%	
Mountain (AZ, CO, ID, MT, NM, NV, UT, WY)	3	3.5%	2	2.8%	1	7.1%	
New England (CT, MA, ME, NH, RI, VT)	4	4.7%	2	2.8%	2	14.3%	
Pacific (AK, CA, HI, OR, WA)	5	5.8%	3	4.2%	2	14.3%	
South Atlantic (DC, DE, FL, GA, MD, NC, SC, VA, WV)	16	18.6%	16	22.2%	0	0.0%	
Territory (PR)	1	1.2%	1	1.4%	0	0.0%	
West North Central (IA, KS, MN, MO, ND, NE, SD)	6	7.0%	5	6.9%	1	7.1%	
West South Central (AR, LA, OK, TX)	12	14.0%	10	13.9%	2	14.3%	
What best describes your program?							
Community-based	22	25.6%	19	26.4%	3	21.4%	
Community-based, university affiliated	31	36.0%	28	38.9%	3	21.4%	.27
University based	33	38.4%	25	34.7%	8	57.1%	
Given your current resources, how much time do you feel you would need to create the new rotations and experiences required in the new rules?							
Ready now	6	7.0%	4	5.6%	2	14.3%	
< 1 year	21	24.4%	16	22.2%	5	35.7%	
1 year	22	25.6%	20	27.8%	2	14.3%	
2 years	20	23.3%	15	20.8%	5	35.7%	
3 years	10	11.6%	10	13.9%	0	0.0%	
≥ 4 years	3	3.5%	3	4.2%	0	0.0%	
Missing	4	4.7%	4	5.6%	0	0.0%	

FRIEDA, Fellowship and Residency Electronic Interactive Database Access.

Table. Continued.

	Frequency (N = 86)	Percentage	3 years (n = 72)		4 years (n = 14)		P-value
What additional resources would you require to meet the new requirements?*							
Additional funding aside from salary	48	55.8%	45	62.5%	3	21.4%	
Additional training sites	41	47.7%	33	45.8%	8	57.1%	
Additional core faculty	36	41.9%	34	47.2%	2	14.3%	
Additional clinical faculty	20	23.3%	19	26.4%	1	7.1%	
More protected time	41	47.7%	38	52.8%	3	21.4%	
Additional simulation or procedure lab time	36	41.9%	33	45.8%	3	21.4%	
Do you agree with the change to require 48 months of training for all EM programs?							
No	52	60.5%	52	72.2%	0	0.0%	
Yes	29	33.7%	15	20.8%	14	100.0%	<.001
Missing	5	5.8%	5	6.9%	0	0.0%	
Total changes needed in structured experiences							
0	1	1%	1	1%	0	0.0%	
1 to 2	31	36%	28	39%	3	21.4%	
3 to 4	28	33%	21	29%	7	50.0%	.40
≥ 5	22	26%	18	25%	4	28.6%	
Missing	4	5%	4	6%	0	0.0%	
Total changes needed in required rotations							
0	14	16%	11	15%	3	21.4%	
1 to 2	34	40%	30	42%	4	28.6%	
3 to 4	24	28%	19	26%	5	35.7%	.72
≥ 5	10	12%	8	11%	2	14.3%	
Missing	4	5%	4	6%	0	0.0%	
Anticipated changes in resident complement							
Decrease	12	14%	10	13.9%	2	14.3%	
No Change	25	29.1%	15	20.8%	10	71.4%	<.001
Increase	44	51.2%	42	58.3%	2	14.3%	
Missing	5	5.8%	5	6.9%	0	0.0%	

*Not mutually exclusive.
EM, emergency medicine; *FRIEDA*, Fellowship and Residency Electronic Interactive Database Access.

would require two years, and 13 (15%) would require more than three years to prepare.

Overall Support

Of the PDs of four-year programs, 100% (14/14) supported the change to a minimum 48 months of residency training. However, only 21% (15/72) of three-year PDs supported the change (P<.001).

DISCUSSION

Structured Experiences

Our survey results indicate that the new program requirements would require a substantial need for curricular revision, which impacts programs differently. For the new "experiences" requirement, only one PD surveyed reported already having all components in place. By contrast, 36% of PDs (31/86) reported that they would probably require one to two changes, and 26% (22/86) would have to make ≥ 5 curricular changes to meet the "experiences" requirements. Curricular revision, including time to pilot, revise, and assess the curricula, is a time-intensive process that can take over a year.

Required Rotations

The required rotations also pose challenges for programs.

While 16% (14/86) reported already having all required rotations, 40% (34/86) of the PDs surveyed reported that they would require ≥ 3 revisions to their rotations. When these new rotations require a new training site, such as adding a low-resource ED, it takes a considerable amount of time to research sites and reach agreements. These external sites can also impact the funding of programs through the Centers for Medicare and Medicaid Services.[8] Additionally, new rotations may require the addition of new faculty, more faculty development, and institutional agreements that cost money and take time.

Time Needed

While 57% of the PDs surveyed (49/86) reported readiness for changes in one year, 38% (33/86) reported they would need more than one year to prepare for the new requirements. This affected both three-year (28/72, 39%) and four-year (5/14, 36%) programs. More concerning is that 15% (13/86) of the PDs surveyed anticipated needing more than three years to prepare for the new program requirements. If those programs were truly unable to prepare in the time frame proposed by the Residency Review Committee (RRC) and decided to close their programs, this could have a major impact on the number of trainees in EM. Additionally, should the RRC-EM grant exceptions or extensions to some programs transitioning to a 48-month format, it could create a competitive advantage to those programs in resident recruitment.

Overall Support

While overall support for the change to 48 months of training was universal for the PDs of four-year programs, there was considerable disagreement among the PDs of three-year programs, with only 15 (22%) supporting the change and 52 (78%) opposing. Our findings of support for a 48-month training requirement mirror a previous study that showed a strong correlation between the current length of a program and its PD's support for that format.[9]

There has been robust discussion regarding the proposed changes since they were presented. Emergency medicine is not alone in considering lengthening residency training time. Family medicine has also discussed a transition to a 48-month training program, which would entail more study and a gradual transition rather than a sudden turnaround.[10] The majority of EM program directors surveyed indicated that they would be likely to increase their complements of residents, which could significantly impact the future workforce in EM. Further study is needed to determine how these complement changes may affect the total number of residency spots available in EM each year. More study is needed to fully understand the impacts these changes would have on EM training programs, as well as their impact on the costs involved, especially when considering the lack of evidence to support the extension of training.

LIMITATIONS

The results of this survey do not include all EM residency programs in the United States, as not all programs are part of CORD, and not all members participate in the list-serv we used to disseminate the survey. Additionally, only 29.9% of programs responded to the survey, creating a significant risk of non-responder bias; however, an appropriate representation of programs both geographically and in terms of length of training was included, which provides support that the data are appropriately representative of the general EM academic community. The narrow three-week window to respond also may have impacted the total number of responses. Finally, we did not collect data on whether the respondent was a program director or their designee, only that they attested to being either the PD or a designee.

CONCLUSION

Most of the program directors who responded to a survey on the proposed new minimum of 48 months training in emergency medicine were opposed to the change, and a significant minority reported being unprepared to implement the new requirements within one year as proposed by the RRC-EM. If the ACGME does adopt the proposed program requirements in total, multiple years may be required for programs to create new and effective curricula and rotations. More study is needed on the impact of the proposed changes that focuses on the outcomes of graduates. Previous studies have already shown us that graduates of three- and four-year programs perform similarly on the American Board of Emergency Medicine certifying exam and in clinical practice.[5,6] The ACGME should consider a phased roll-out of new requirements to ensure programs have time to thoughtfully and meaningfully adhere to the new requirements in a way that is beneficial to their trainees.

Address for Correspondence: Richard Austin, MD, Southern Illinois University, School of Medicine, Department of Emergency Medicine, 701 North First Street, Springfield, IL 62781. Email: raustin@siumed.edu.

Conflicts of Interest: By the WestJEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Austin et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Accreditation Council for Graduate Medical Education. ACGME Program Requirements for Graduate Medical Education in Emergency Medicine. 2025. Available at: https://www.acgme.org/globalassets/pfassets/reviewandcomment/2025/110_emergencymedicine_rc_02122025.pdf. Accessed March 2, 2025.
2. Nelson LS, Calderon Y, Ankel FK, et al. American Board of Emergency Medicine report on residency and fellowship training information (2021-2022). *Ann Emerg Med.* 2022;80(1):74-83.
3. Regan L, McGee D, Davis F, et al. Building the future curriculum for emergency medicine residency training. *J Grad Med Educ.* 2025;17(2):248-53.
4. Accreditation Council for Graduate Medical Education. ACGME Program Requirements for Graduate Medical Education in Emergency Medicine Summary and Impact of Major Requirement Revisions. 2025. Available at: https://www.acgme.org/globalassets/pfassets/reviewandcomment/2025/110_emergencymedicine_impact_02122025.pdf. Accessed March 2, 2025.
5. Beeson MS, Barton MA, Reisdorff EJ, et al. Comparison of performance data between emergency medicine 1-3 and 1-4 program formats. *J Am Coll Emerg Physicians Open.* 2023;4(3):e12991.
6. Nikolla DA, Zocchi MS, Pines JM, et al. Four- and three-year emergency medicine residency graduates perform similarly in their first year of practice compared to experienced physicians. *Am J Emerg Med.* 2023;69:100-7.
7. Emergency Medicine Residents' Association. EMRA Match. 2025. Available at: https://www.match.emra.org. Accessed March 2, 2025.
8. Association of American Medical Colleges. Medicare Payments for Graduate Medical Education: What Every Medical Student, Resident, and Advisor Needs to Know. Association of American Medical Colleges. 2025. Available at: https://www.aamc.org/media/71701/download?attachment. Accessed September 10, 2025.
9. Hopson L, Regan L, Gisondi MA, et al. Program director opinion on the ideal length of residency training in emergency medicine. *Acad Emerg Med.* 2016;23(7):823-7.
10. Green LA, Miller WL, Frey JJ 3rd, et al. The time is now: a plan to redesign family medicine residency education. *Fam Med.* 2022 Jan;54(1):7-15.

Virtual Interviews Correlate with Home and In-State Match Rates at One Emergency Medicine Program

Christine Motzkus, MD, PhD* *Indiana University School of Medicine, Department of Emergency Medicine, Indianapolis, Indiana
Casey Frey, MD† †Boone County Emergency Medicine, Indianapolis, Indiana
Aloysius Humbert, MD*

Section Editors: Jules Jung, MD and Andrew Golden, MD
Submission history: Submitted June 2, 2024; Revision received November 22, 2024; Accepted November 26, 2024
Electronically published February 5, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.21292

Introduction: Incorporating virtual interviews into residency recruitment may help diversify access to residency programs while reducing the cost involved with travel and lodging. Programs may be more likely to rank students they have met in person at an interview when compared to unknown virtual applicants. Our objective was to characterize home institution, in-state, and in-region match rates to emergency medicine (EM) residency programs for fourth-year medical students.

Methods: We used National Residency Matching Program data available to the program director to identify medical school and match location of fourth-year medical students who interviewed at a large EM residency program in the Midwest from 2018–2023. Students' medical schools and ultimately matched programs were mapped to Electronic Residency Application Service geographic regions; subgroup analyses evaluated allopathic and osteopathic medical students separately. We used chi-square tests to compare proportions of students matching to home, in-state, or in-region programs across years.

Results: There were 1,401 applicants with match information available. The percentage of students matching to a home institution remained stable over the course of the study. The percentage of students matching to an in-state institution increased over the first two years of virtual interviews rising from 23.2% in the 2020 match to 30.8% in-state matches for the 2022 match. Chi-square tests did not reveal any significant differences among groups for all applicants. Allopathic medical students demonstrated a significant increase in matches to home institutions. In-region matches stayed relatively stable over the study time frame regardless of subgroup.

Conclusion: Virtual interviews changed the landscape of residency interviews. Home institution and in-state matches may be more likely for applicants from allopathic schools who participated in a virtual interview as both programs and applicants are more familiar with each other; however, our study did not find convincing evidence of this possibility among all applicants. Additional study is needed to determine ongoing effects of the transition to virtual interviews. [West J Emerg Med. 2025;26(2)285–289.]

INTRODUCTION

Interviews are a critical element of the residency match process for both residency programs and medical students to ensure selection of high-quality applicants and training programs. Until the COVID-19 pandemic struck in early 2020, nearly all interviews were conducted in person requiring medical students to arrange travel to different program locations, a process known to be expensive and time-consuming.[1] With travel restrictions and social distancing concerns, the 2021 Match cycle marked the first use of virtual interviews for emergency medicine (EM) residency spots.

The transition to virtual interviews was marked with uncertainty from both students and programs. Students were uncertain as to how they would be able to assess programs while programs felt similarly about the ability to assess

students, particularly those who had not completed a rotation at their program. Program directors have also been noted to report difficulty assessing the fit of applicants despite the increased convenience of virtual interviews.[2] However, virtual interviews offer increased opportunities for students to complete additional interviews at lower cost, which has been noted in surgical specialties with a transition to virtual interviews.[3] Program directors also expressed concerns that programs would match more students from their home programs, reducing opportunities for programs to benefit from students with non-homogenous medical student training.[2] For fellowship applicants, similar concerns have been expressed; however, there was not found to be a significant increase in interviews completed by pediatric EM fellowship applications or a change in fellowship applicants matching within their preferred state.[4]

We evaluated whether the transition to virtual interviews at one large, Midwestern EM program correlated with increased numbers of students matching to their home programs. Additionally, we evaluated whether the transition to virtual interviews correlated with increased numbers of students matching to in-state or in-region program.

METHODS

Study Population

We obtained data from the National Resident Matching Program (NRMP) for ranked medical students from one Midwestern EM residency program for the years 2018–2023.

Data Collection and Analysis

All medical students who interviewed at one midwestern university from 2018–2023 had their home and matched programs recorded as part of routine NRMP recordkeeping. All data was stored on a secure server. This data was deidentified by the program director and coded to determine whether the interviewee matched with a program from any of the following: 1) the same institution as their medical school; 2) the same state as their medical school; and 3) the same region as their medical school. Regions were defined according to Electronic Residency Application Service (ERAS) geographic preference regions; these regions were designated beginning in 2022. Interviewees were able to signal a geographic preference according to these regions. Areas of disagreement regarding program affiliation were discussed between authors and resolved. Author AH performed the initial coding, and after review by author CM any discrepancies were resolved between affiliations using resources including the Accreditation Council for Graduate Medical Education and program websites to verify affiliations. We used chi-squared tests to assess differences between groups.[5] We conducted subgroup analyses to evaluate differences between applicants from allopathic (MD) and osteopathic schools (DO).

Outcome

The primary outcome of this study was percentage of students who matched to programs within their home institution, state, or region.

Ethics Statement

This study was reviewed and approved by the institutional review board. No funding was obtained for this study.

RESULTS

Over the six interview cycles included in the study period, 1,401 students contributed data to the NRMP and were subsequently coded to having matched at their home program or to programs within the same state or region. There was an increase in the number of interviews completed by the program over the six-year period with an average of 201 interviews completed in an in-person format prior to and during the 2020 pre-pandemic interview season. After the global COVID-19 pandemic, beginning in the 2021 recruitment season, there was an initial increase in the number of interviews offered as the format switched to virtual. Virtual interviews continued throughout the 2022 and 2023 interview seasons, but overall numbers of interviews decreased during this time frame (Table 1).

An increasing percentage of students matched to their home institution from 2020–2023, with the largest increase being observed over the 2020–2021 season corresponding with the transition to virtual interviews; however, this trend was not statistically significant. Notably, proportions of students matching to home institutions were similar in 2018 and 2023. An increasing number of students matched to in-state institutions from 2020 to 2021; further increases in the percentage of in-state matches were observed from 2021 to 2022 before stabilizing at approximately 30% of in-state matches in the final included year, close to 2018 levels. In-region matches remained roughly stable across the study period with slightly less than half of students matching to an institution in their home ERAS geographic region (Table 1). Chi-square tests did not reveal any significant differences between groups.

When evaluating the subgroup of applicants from allopathic schools, it appeared that an overall increased proportion of these applicants matched to their home institutions over the course of the six years of the study ($P < 0.01$). This increase was most notable in 2023 when 31.8% of these applicants matched to their home institutions, nearly double that of any prior year. There was also an increase in MD applicants matching to institutions within the same state as their medical school over the study period ($P = 0.01$). Regional institution matches for allopathic applicants remained stable over the study period. Osteopathic applicants did show an increase in proportion of them matching to in-state or in-region institutions; however, these trends were not statistically significant (Table 2).

Table 1. Applicant match location by year.

	Application year						
Matched to:	**2018 (n = 199)**	**2019 (n = 202)**	**2020 (n = 202)**	**2021 (n = 321)**	**2022 (n = 239)**	**2023 (n = 238)**	***P*-value**
Home institution	16.1%	12.9%	11.4%	14.0%	15.5%	16.4%	0.64
State institution	29.1%	27.6%	23.2%	26.4%	30.5%	29.4%	0.59
Regional institution	46.0%	45.7%	47.0%	44.4%	47.7%	47.5%	0.96

DISCUSSION

We found no statistically significant difference of match location among all applicants applying to one Midwestern EM residency program after the implementation of virtual interviews. Similar numbers of applicants matched to the same ERAS region as their medical school regardless of in-person or virtual- interview format. Applicants from allopathic schools did show an increased proportion matching at their home or state institutions after the implementation of virtual interviews, and this finding was statistically significant. An increasing number of osteopathic applicants matched to in-state institutions after the implementation of virtual interviews. This trend did not reach statistical significance but did approach significance.

Virtual interviews reduce cost to applicants and may allow applicants to complete interviews at additional programs. Correspondingly, the number of interviews conducted by the program increased in the first year of virtual interviews prior to stabilizing at a somewhat higher number than in the previous time frame with in-person interviews. Increased numbers of interviews offered meant increased time demands from faculty participating in those interviews and may have contributed to interview fatigue. Notably, one obstetrics/gynecology program did not find an increase in numbers of interviews offered to or completed by applicants.[6] Conversely, applicants having the ability to complete more interviews may allow for fewer financial disparities to perpetuate among students, as some students may have previously limited interviews due to cost concerns. An Association of American Medical Colleges survey showed that previous monetary costs for residency interviews ranged from $1,000 to $11,580 (median $4,000).[7] Using a virtual process may also benefit financially challenged students by eliminating the cost of flights and hotels, and other travel expenses previously necessary to complete the interview season. The transition to virtual interviews may have downstream effects on the diversity of the EM workforce if applicants are less likely to match outside their home or in-state programs.[8]

Higher percentages of allopathic students matching to in-home and in-state programs may indicate that programs and applicants alike preferentially rank each other due to familiarity, although given the uncertainties of the COVID-19 pandemic and restrictions on away rotations from 2021 onward, it is difficult to attribute this increase to one factor. It is well known that most students have a strong geographic preference to match near their home and that location is a significant driver of residency program choice.[9]

Table 2. Allopathic and osteopathic applicant match location by year.

	Application year						
Matched to:	**2018 (n = 176)**	**2019 (n = 183)**	**2020 (n = 184)**	**2021 (n = 268)**	**2022 (n = 213)**	**2023 (n = 198)**	***P*-value**
MD applicants							*P*-value
Home institution	18.2%	14.2%	12.0%	16.8%	17.4%	31.8%	<0.05
State institution	31.8%	29.5%	22.8%	26.5%	30.1%	40.4%	<0.05
Regional institution	47.2%	44.8%	47.8%	43.7%	47.4%	50.0%	0.81
	2018 (n = 22)	**2019 (n = 19)**	**2020 (n = 16)**	**2021 (n = 38)**	**2022 (n = 24)**	**2023 (n = 32)**	
DO applicants							
Home institution	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.13
State institution	9.1%	10.5%	31.3%	36.8%	37.5%	34.4%	0.08
Regional institution	36.4%	42.1%	43.8%	68.4%	54.2%	40.6%	0.12

MD, Doctor of Medicine; *DO*, Doctor of Osteopathic Medicine.

This trend has also been seen in orthopedic surgery programs with their transition to a virtual interview process[10]; however, this did not hold true for neurology and general surgery programs.[11,12] Students' geographic preferences in EM seem to have been amplified by the transition to virtual interviews, particularly among allopathic applicants. While virtual interviews are not the only change that occurred in the resident recruitment process during the 2021 and subsequent interview seasons, it is plausible that interview format is one of many factors influencing student interview behavior, although we did not find evidence of this behavior among all applicants in our study.

It was not possible to determine what effect other factors including travel restrictions, societal unrest, and other changes had on applicant behavior and their process of selecting application locations, interviews, and ultimately match location. Further, it is difficult to understand what effect the advent of program signaling had on both interviewee and interviewer behavior after its introduction in 2022, and this remains an active area of study. Understanding the stability of the in-region match rates is difficult to interpret but suggests that similar numbers of students are looking to leave their medical school region over time. The ERAS regions were also defined during this time frame, which may have altered students' perceptions of region. These geographic preferences are an area for ongoing study as programs evaluate residency matches to serve their communities and ensure mutually beneficial matches between programs and applicants.

LIMITATIONS

This study has multiple limitations. First, only one large, Midwestern EM residency program is represented. There are multiple other factors including the numerous social and societal changes that took place during the COVID-19 pandemic, as well as the introduction of preference signaling certainly impacted applicants' match preferences and interview behaviors in addition to the transition to a virtual interview model. We were unable to control for these factors or other changes to applicant behavior such as the potential desire to remain closer to home when travel was more constrained during the global pandemic or as a result of ongoing societal unrest. Of note, overall applicant behavior also changed across match years with a decrease in applications beginning in 2022 and increased proportions of osteopathic and international medical graduates.[13] Additionally, EM applicants continue to be advised to complete no more than one away rotation per interview cycle, which limits program and applicant exposure to each other. Further, while ERAS regions were used, this does not account for applicants who may have matched just across the border to another region, creating a false inflation of geographic distance.

CONCLUSION

Virtual interviews are now a fixture of the residency application process with EM programs requiring this process to participate in the match.[14] We did not find statistically significant differences in home institution or in-state match rates for all applicants; however, allopathic applicants did have an increase in proportion of students matching to their home institution. While our data does not suggest an overall impact of virtual interviews in match decisions made by applicants or programs, these trends warrant additional monitoring for ongoing impact, particularly among allopathic applicants where an increase in home and in-state matches was statistically significant. Further larger studies would be helpful to understand how transitioning to this model affects applicant match behavior. Additional studies would be beneficial to help programs further understand key areas of focus and ensure successful interview planning for EM programs.

Address for Correspondence: Christine A. Motzkus, MD, PhD, Indiana University School of Medicine, Department of Emergency Medicine, 2651 E Discovery Pkwy., Room C3018, Bloomington, IN 47408. Email: cmotzkus@iuhealth.org

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Motzkus et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Joshi A, Bloom D, Spencer A, et al. Video interviewing: a review and recommendations for implementation in the era of COVID-19 and beyond. *Acad Radiol.* 2020;27(9):1316–22.
2. Ponterio JM, Levy L, Lakhi NA. Evaluation of the virtual interview format for resident recruitment as a result of COVID-19 restrictions: residency program directors' perspectives. *Acad Med.* 2022;97(9):1360–7.
3. Newsome K, Selvakumar S, McKenny M, et al. Shifting the surgical residency match to a 100% virtual interview format during the COVID-19 pandemic: how has it affected placement into surgical training programs? *Amer Surg.* 2023;89(4):935–41.
4. Baghdassarian A, Bailey JA, Cagler D, et al. Virtual interviews and the pediatric emergency medicine match geography: a national survey. *West J Emerg Med.* 2024;25(2):186–90.

5. Preacher K. J. 2001. Calculation for the chi-square test: an interactive calculation tool for chi-square tests of goodness of fit and independence [computer software]. Available at: http://quantpsy.org. Accessed January 20, 2024.
6. Santos-Parker KS, Hammoud MM, Winkel AF, et al. Distributions of residency interviews with the implementation of virtual interviews and standardization of interview offer dates. *J Surg Educ.* 2022;79(5):1105–12.
7. Association of American Medical Colleges. 2024. The cost of interviewing for residency. Available at: https://students-residents.aamc.org/financial-aid-resources/cost-interviewing-residency. Accessed March 30, 2024.
8. Capers Q, Johnson A, Berlacher K, et al. The urgent and ongoing need for diversity, equity, and inclusion in the cardiology workforce in the United States. *J Am Heart Assoc.* 2021;10(6):e018893.
9. Hasnie UA, Hasnie AA, Preda-Naumescu A, et al. Exploring match space: how medical school and specialty characteristics affect residency match geography in the United States. *Acad Med.* 2022;97(9):1368–73.
10. Nestler AJ, Feibel BM, Beason AM, et al. The student you know: orthopedic surgery home program match rates and geographic relationships before and after COVID-19. *J Surg Educ.* 2022;80(3):476–82.
11. Beinhoff P, Attlassy N, Carlson C. No geographic distribution change among residency applicants in the neurology match during COVID-19. *Cureus.* 2023;15(2):e34898.
12. Beesley H, Pernar L, Kettoola Y, et al. The association between virtual interviewing and geographical distribution of matched residency programs for general surgery applicants. *J Surg Educ.* 2022;80(2):194–9.
13. National Residency Matching Program. 2023. Results and data: 2023 main residency match. Available at: https://www.nrmp.org/match-data/2023/06/results-and-data-2023-main-residency-match/. Accessed November 6, 2024.
14. Association of American Medical Colleges. 2024. AAMC interview guidance for the 2022–2023 residency cycle. Available at: https://www.aamc.org/about-us/mission-areas/medical-education/interviews-gme-where-do-we-go-here. Accessed November 6, 2024.

Development of a Reliable, Valid Procedural Checklist for Assessment of Emergency Medicine Resident Performance of Emergency Cricothyrotomy

Dana E. Loke, MD, MS* [*]
Andrew M. Rogers, MD, MBA[†]
Morgan L. McCarthy, MD[‡§]
Maren K. Leibowitz, MD[¶]
Elizabeth T. Stulpin, MD[#]
David H. Salzman, MD, Med[‡||]

[*]University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, Madison, Wisconsin
[†]NorthShore University Health System, Division of Emergency Medicine, Evanston, Illinois
[‡]Northwestern University, Feinberg School of Medicine, Department of Emergency Medicine, Chicago, Illinois
[§]St Luke's Hospital, Department of Emergency Medicine, New Bedford, Massachusetts
[¶]Icahn School of Medicine at Mount Sinai, Institute of Critical Care Medicine, New York, New York
[#]Emory University Hospital, Department of Emergency Medicine, Atlanta, Georgia
[||]Northwestern University, Feinberg School of Medicine, Department of Medical Education, Chicago, Illinois

Section Editors: Matthew Tews, MD and Christine Stehman, MD
Submission history: Submitted June 15, 2024; Revision received November 8, 2024; Accepted November 12, 2024
Electronically published January 30, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.20365

Introduction: Emergency cricothyrotomy is a rare but potentially life-saving procedure performed by emergency physicians. A comprehensive, dichotomous procedural checklist for emergency cricothyrotomy for emergency medicine (EM) resident education does not exist.

Objectives: We aimed to develop a checklist containing the critical steps for performing an open emergency cricothyrotomy, to assess performance of EM residents performing an open emergency cricothyrotomy using the checklist on a simulator, and to evaluate the reliability and validity of the checklist for performing the procedure.

Curricular Design: We developed a preliminary checklist based on literature review and sent it to experts in EM and trauma surgery. A modified Delphi approach was used to revise the checklist and reach consensus on a final version of the checklist. To assess usability of the checklist, we assessed EM residents using a cricothyrotomy task trainer. Scores were determined by the number of correctly performed items. We calculated inter-rater reliability using the Cohen kappa coefficient. Validity was assessed using the Welch *t*-test to compare the performance of residents who had and had not performed an open emergency cricothyrotomy, and we used analysis of variance to compare performance of postgraduate year (PGY) cohorts.

Impact/Effectiveness: The final 27-item checklist was developed after three rounds of revisions. Inter-rater reliability was strong overall ($\kappa = 0.812$) with individual checklist items ranging from slight to nearly perfect agreement. A total of 56 residents participated, with an average score of 14.3 (52.9%). Performance varied significantly among PGY groups ($P < 0.001$). Residents who had performed an emergency cricothyrotomy previously performed significantly better than those who had not ($P = 0.005$). The developed checklist, which can be used in procedural training for open emergency cricothyrotomy, suggests that improved training approaches to teaching and assessing emergency cricothyrotomy are needed given the overall poor performance of this cohort. [West J Emerg Med. 2025;26(2)279–284.]

BACKGROUND

Emergency cricothyrotomy is a rare but potentially life-saving procedure that emergency physicians (EP) must be able to competently perform. It is performed when the EP is unable to oxygenate and ventilate a patient after rapid sequence intubation is initiated and, therefore, must pursue cricothyrotomy in a time-sensitive manner. Thus, it is essential for EPs to be able to perform the procedure correctly. Furthermore, the Accreditation Council for Graduate Medical Education includes cricothyrotomy as a "key procedure" for which residents "must demonstrate competence."[1] However, there are few opportunities to learn this procedure in the clinical environment, with one study demonstrating that only 22% of graduating emergency medicine (EM) residents had the opportunity to perform cricothyrotomy on a living patient.[2] Another study indicated that even experienced EPs felt that they lacked training in performing cricothyrotomy and that this procedural inexperience could directly affect the survival of a patient and lead to high emotional pressure.[3] Lastly, the critically important nature of the procedure makes learning on shift a patient safety issue.

The combination of competency-based approaches using checklist-based assessments and the simulation environment has demonstrated a long track record of improving resident performance on specific procedural skills.[4–8] While various instructional videos and checklists meant for different specialties are available, a standardized, reliable, valid, comprehensive, and dichotomous procedural checklist for assessment of performing emergency cricothyrotomy for EM resident education is lacking.[9–11] Historically, the study site program's method for teaching the open emergency cricothyrotomy occurred during the annual "rare procedures" simulation lab. These sessions involved non-standardized practice with a task trainer or sheep larynx that did not follow a competency-based training model.

OBJECTIVES

Recognizing this unmet need in EM procedural training for our learners, we set several objectives in this study. The primary objective was to develop a checklist containing the critical steps for performing an open emergency cricothyrotomy based on input from a multidisciplinary team of experts. The second objective was to evaluate the reliability and validity of the checklist for performing open emergency cricothyrotomy. Finally, the third objective was to use the checklist to assess a group of EM residents on their ability to perform the procedure on a simulator and compare performance by training year.

CURRICULAR DESIGN

Checklist Development

We performed a literature review in MEDLINE and the MedEd Portal to assess published literature for emergency cricothyrotomy procedure checklists and curriculums. Key phrases for literature searches included "emergency cricothyrotomy curriculum," "emergency cricothyrotomy checklist," "emergency cricothyrotomy procedure," "emergency cricothyrotomy simulation," "emergency cricothyrotomy resident," "emergency cricothyrotomy residency," "emergency cricothyrotomy education," and variations and combinations of the key words/phrases. Searches included all articles published until the search date of November 1, 2020. An EM procedural skills textbook and a surgical technique textbook were reviewed as well.[12,13] We also evaluated relevant articles from the bibliographies of the textbooks and included studies for inclusion.

We used the Stufflebeam framework for checklist development after the literature review was completed.[14] A preliminary dichotomous ("done" vs "incorrect/not done") checklist was developed based on this literature review. The initial checklist was sent to a panel of 13 experts comprised of emergency physicians and trauma surgeons of varying practice type (academic, community, military), geographic practice location (within the United States), and gender. Practice type included 10 academic, two community, and one military hospital; practice location included five internal and eight external; and breakdown by sex was five female and eight male. Experts were blinded to each other's identities and comments. We informed the expert panel of the curriculum's intended audience of EM residents with anticipated use for a competency-based curriculum. We used a modified Delphi approach to serially refine the checklist and reach consensus on a final checklist.[15,16] We then pilot-tested the checklist to ensure the items, wording, and formatting were ideally operationalized. Finally, the expert panel reviewed it for final approval.

Study Population

The study was performed at a single urban academic center with a four-year EM residency training program. Four residents were excluded from the study due to their participation in the checklist design and assessment process. All other EM residents were included in the education as part of the annual simulation curriculum; however, participation in the study was voluntary. The study was reviewed by the institutional review board (IRB) at Northwestern University, Feinberg School of Medicine and determined to be exempt. Written informed consent was obtained from participants using a consent form approved by the IRB.

Assessment

Assessments occurred in the simulation center using a simulation manikin (TraumaMan, Simlab, Seattle, WA) from August 31–September 28, 2021. Performance assessments were documented using an electronic version of the checklist in Qualtrics (Qualtrics, Seattle, WA), including a dichotomous "Yes" or "No" for completion of each step.

One in-person rater (DL) was situated adjacent to the simulation manikin with the ability to move about the simulation room to ensure ideal visualization. Audiovisual recording of the assessment included one camera overhead providing a direct overhead view and a second camera situated to provide a view from the side. Each participant assessment was recorded from start to completion of the checklist. The dual video feeds with audio were saved as a single side-by-side video recording. These recorded videos were reviewed by a second rater at a later time. We used an online random number picker (https://www.random.org/lists/) to select 30% of the participants for scoring by the second rater.[17] The second rater (AR) scored the randomly selected sample of video recordings using the same electronic assessment instrument in Qualtrics.

Data Analysis

The checklist was analyzed for inter-rater reliability and validity among a cohort of EM residents ranging from PGY1-4. Inter-rater reliability was calculated overall and for each checklist step using the Cohen kappa coefficient. We determined validity using the Welch *t*-test to compare the performance of participants who had and had not performed an emergency cricothyrotomy in clinical practice or simulation and also between consecutive PGY groups. Analysis of variance was used to compare performance among PGY cohorts.

IMPACT/EFFECTIVENESS

Results

The literature search produced a total of 394 articles. After review, 13 articles were deemed suitable to inform checklist development. An additional two articles were identified and included upon reviewing references of the included articles and the two textbooks. We developed a preliminary 33-item dichotomous checklist based on this literature review. Consensus was achieved after three rounds of revisions, resulting in the fourth version of the checklist being the final version. We then tested the final 27-item checklist among ourselves for usability. Only minor wording and formatting changes were made to ensure ideal operationalization of the checklist. The final checklist was approved by the expert panel after usability testing, and no additional revisions were suggested.

The table includes percentage correct of checklist items, inter-rater agreement, and Cohen kappa coefficients for each checklist item. Overall, inter-rater reliability was strong ($\kappa = 0.812$) with individual checklist items ranging from fair to nearly perfect agreement, with one item having slight agreement. A total of 56 residents participated, including 15 PGY-1, 14 PGY-2, 13 PGY-3, and 14 PGY-4 residents. While only one resident had performed an emergency cricothyrotomy on a live patient, 69.6% had previously performed an emergency cricothyrotomy in simulation. The average checklist score for the overall resident cohort was 14.3 (52.9%). Emergency medicine resident checklist performance varied by PGY class (Figure). Performance varied significantly amongst PGY groups ($P < 0.001$). The PGY-4s performed best with an average score of 16.7 (61.9%) of checklist items completed correctly. They performed better than PGY-3s, but not significantly (61.9% vs 59.5%, $P = 0.21$). The PGY-3s performed significantly better than PGY-2s (59.5% vs 48.9%, $P = 0.01$). The PGY-2 performance was better but not significantly different compared to PGY-1 performance (48.9% vs. 42.7%, $P = 0.13$). The residents who had previously performed an emergency cricothyrotomy on a live patient or in simulation performed significantly better than those who had not (56.8% vs. 44.2%, $P = 0.005$).

Discussion

Although we identified procedural narratives and checklists with varying degrees of specificity for our learner group at the time of our literature review, our search demonstrated a lack of a standardized, validated, reliable, and dichotomous procedural checklist for emergency cricothyrotomy for EM residents. This checklist adds to more recently published articles targeting attendings, students, and "novice" learners. This newly developed procedural checklist for emergency cricothyrotomy addresses this unmet need for EM resident procedural training.

The expert panel provided critical insight during the checklist development. Our initial checklist focused on the classic "hook and dilator," scalpel-based approach to emergency cricothyrotomy. However, we ultimately revised the checklist based on expert feedback to include the additional accepted approaches of "scalpel only" and "bougie-assisted" emergency cricothyrotomy. The inclusion of all three accepted approaches allowed for a more versatile checklist that is more generalizable to all resource settings and better reflects the variable real-world environment and urgency of the procedure. The inclusion of multiple techniques also suggests generalizability to other clinical environments, such as surgery and otolaryngology; however, this was not the intended audience at the time the checklist was developed. While there are several potential options for performing an emergency cricothyrotomy, including a needle/wire Seldinger technique, this checklist reflects the development with the primary construct of using a scalpel-based approach.

This study's strong overall inter-rater reliability using this checklist and one in-person rater and one remote-video rater reinforces previous studies using a similar technique.[18,19] Additionally, inter-rater reliability using this method was strong overall, which is consistent with prior checklist development studies with similar methods.[18,19] Most individual items had moderate to near-perfect inter-rater

Table. Percent correct, inter-rater agreement, and reliability for individual checklist-item scoring.

	Checklist item	Percent correct	Rater agreement	Kappa coefficient
1.	Gathers sterile supplies	48.2%	64.7%	0.370
2.	Gathers primary cricothyrotomy procedure supplies	66.1%	100%	1.000
3.	Gathers secondary/supplemental cricothyrotomy procedure supplies	82.1%	94.1%	0.821
4.	Gathers supplemental intubation supplies	0%	100%	n/a*
5.	Washes hands	17.9%	94.1%	0.638
6.	Sterilizes the neck	87.5%	94.1%	0.767
7.	Dons personal protective equipment	67.9%	100%	1.000
8.	Proceduralist positions on the patient's right side	89.3%	88.2%	0.605
9.	Identifies cricothyroid membrane (CTM)	482.%	52.9%	0.171
10.	Uses thumb and middle finger of non-dominant hand to stabilize airway	33.9%	88.2%	0.721
11.	Confirms incision site with palpation by index finger on the CTM using non-dominant hand while maintaining stabilization using thumb and middle finger of non-dominant hand	28.6%	88.2%	0.595
12.	Uses scalpel to make vertical skin incision ~2–4 cm in length over the CTM using dominant hand	57.1%	64.7%	0.320
13.	Dissects down to CTM	87.5%	88.2%	0.433
14.	Re-identifies CTM by palpation or visualization	76.8%	100%	1.000
15.	Makes ~1–2 cm (width of scalpel blade) horizontal incision through CTM with dominant hand and maintains scalpel blade in trachea	51.8%	76.5%	0.514
16.	Maintains patency of tract	12.5%	94.1%	n/a*
17.	Removes scalpel, only after tracheal hook, Trousseau dilator, bougie, or secondary scalpel handle is in place, maintaining patency of CTM	12.5%	94.1%	n/a*
18.	Proceduralist dilates CTM	3.6%	100%	1.000
19.	Inserts endotracheal tube or trach	91.1%	100%	1.000
20.	Inserts endotracheal tube or trach to correct depth	21.4%	88.2%	0.452
21.	Inflates the cuff with a 10-cc syringe	78.6%	88.9%	0.766
22.	Connects bag-valve-mask to endotracheal tube/trach and begins assisted ventilation	92.9%	94.1%	0.638
23.	Uses capnography to confirm tube location	89.3%	94.1%	0.638
24.	Listens for bilateral breath sounds	66.1%	94.1%	0.881
25.	Secures endotracheal tube/trach	64.3%	100%	1.000
26.	Orders chest radiograph	46.4%	100%	1.000
27.	Documents procedure	8.9%	100%	1.000

*Unable to calculate kappa coefficient due to one or both raters giving the same score to all scored participants.

reliability, overall demonstrating reliability of the checklist.[20] The items with the lowest kappa scores included "gathers sterile supplies" (item 1), "identifies cricothyroid membrane" (item 9), and "uses scalpel to make vertical skin incision ~2–4 cm in length over the cricothyroid membrane using dominant hand" (item 12). We suspect that this likely reflects the remote nature of the second rater, as mishearing a request for a single piece of equipment or inability to accurately visualize the membrane or exact length of incision on a recorded video would lead raters to score differently. This could have been improved with greater verbalization of all steps by the learner and primary rater or having a second in-person rater when able.

The residents who had performed an emergency cricothyrotomy previously performed significantly better than those who had not, demonstrating criterion validity for this checklist as there was correlation with this group's prior experience. Several studies with similar methods have also demonstrated congruent findings on checklist validity.[18,19] While not significant, more senior PGY residents performed better as well. This may have been due to increased clinical exposure with seeing an emergent cricothyrotomy performed or improved procedural experience with practice in the simulation environment. However, despite these potential exposures and previous experiences, this cohort only correctly completed just over half of the checklist items.

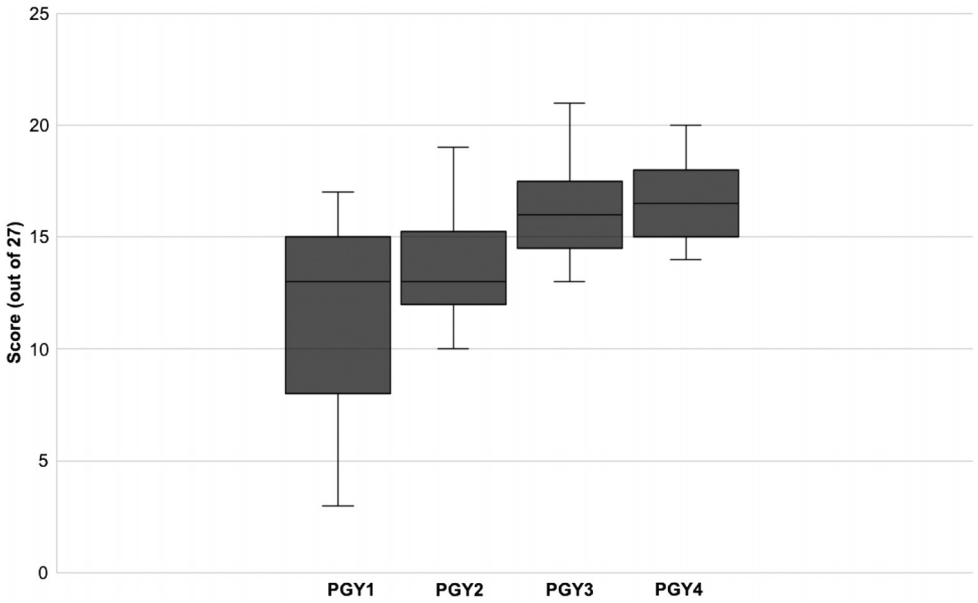


Figure. Emergency cricothyrotomy checklist performance by emergency medicine resident postgraduate year. Box limits represent the 25th and 75th percentiles with the median checklist score represented by the bar.
PGY, postgraduate year.

Additionally, certain items had particularly low completion rate, including "Gathers supplemental intubation supplies" (item 4) (0%); "Proceduralist dilates cricothyroid membrane" (item 18) (3.6%); and "Documents procedure" (item 27) (8.9%). While some of these completion rates may be attributable to the simulation environment, it is important to highlight that merely planning for an intubation would not necessarily ensure that all equipment necessary for a cricothyrotomy was also available. The overall performance of this resident group, with residents only completing roughly 50% of the checklist items, suggests that the current, non-standardized technique for teaching emergency cricothyrotomy in this cohort is lacking and that a competency-based approach using a well-developed procedural checklist may improve performance.

LIMITATIONS

This study has several limitations. First, the single-site nature of the study may not reflect resident performance at other institutions. Studying the checklist's use at other residency sites would help to understand its generalizability to other environments with different approaches to teaching open cricothyrotomy. Second, while we recruited an expert panel including EM and trauma surgery representatives with diversity in practice type, practice location, and gender, most of the experts practiced in an academic environment. Despite this, the steps to performing the procedure should not vary by practice environment and, therefore, we do not believe that this limits validity or generalizability of the checklist. Expert panel review including additional community and hybrid experts would help test this hypothesis.

Third, the checklist and testing were performed using a bloodless simulation task trainer, which may not ideally represent an actual patient encounter. However, the infrequent nature of the procedure, as evidenced by only one resident having performed an emergency cricothyrotomy during their training, necessitates a non-clinical environment training simulation. While emergency cricothyrotomy simulation experience has been documented using sheep larynx and 3D-printed models, our study was not performed using these models and instead used a commercially available training device. Therefore, we do not know the influence of different simulation methods on the study and checklist performance, and this remains an area for future study.

CONCLUSION

We designed a reliable, valid, dichotomous procedural checklist to assess EM residents' ability to perform emergency cricothyrotomy. The overall performance of the residents tested in this study suggests that the current method of teaching emergency cricothyrotomy for this group is insufficient. Given the need to develop procedural competency for this rare but potentially life-saving procedure, a curriculum such as simulation-based mastery learning should be developed to ensure mastery of this procedure for EM residents. The checklist developed in this study could serve as a foundation for such a curriculum.

Address for Correspondence: Dana E. Loke, MD, MS, University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, 800 University Bay Dr., Suite 310, Madison, WI, 53705. Email: dloke@medicine.wisc.edu

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Loke et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Accreditation Council for Graduate Medical Education. ACGME program requirements for graduate medical education in emergency medicine. 2023. Available at: https://www.acgme.org/specialties/emergency-medicine/program-requirements-and-faqs-and-applications/. Accessed September 11, 2023.
2. Makowski AL. A survey of graduating emergency medicine residents' experience with cricothyrotomy. *West J Emerg Med.* 2013;14(6):654–61.
3. Zink W, Bernhard M, Keul W, et al. Invasive techniques in emergency medicine. I. Practice-oriented training concept to ensure adequately qualified emergency physicians. *Anaesthesist.* 2004;53(11):1086–92.
4. Barsuk JH, Cohen ER, Caprio T, et al. Simulation-based education with mastery learning improves residents' lumbar puncture skills. *Neurology.* 2012;79(2):132–7.
5. Barsuk JH, McGaghie WC, Cohen ER, et al. Use of simulation-based mastery learning to improve the quality of central venous catheter placement in a medical intensive care unit. *J Hosp Med.* 2009;4(7):397–403.
6. Miller DT, Zaidi HQ, Sista P, et al. Creation and implementation of a mastery learning curriculum for emergency department thoracotomy. *West J Emerg Med.* 2020;21(5):1258–65.
7. Klein MR, Schmitz ZP, Adler MD, et al. Simulation-based mastery learning improves emergency medicine residents' ability to perform temporary transvenous cardiac pacing. *West J Emerg Med.* 2022;24(1):43–9.
8. Klein MR, Loke DE, Barsuk JH, et al. Twelve tips for developing simulation-based mastery learning clinical skills checklists. *Med Teach.* 2024. In press.
9. Melchiors J, Todsen T, Nilsson P, et al. Preparing for emergency: a valid, reliable assessment tool for emergency cricothyroidotomy skills. *Otolaryngol Head Neck Surg.* 2015;152(2):260–5.
10. Hock SM, Martin JJ, Stanfield SC, et al. Novel cricothyrotomy assessment tool for attending physicians: a multicenter study of an error avoidance checklist. *AEM Educ Train.* 2021;5(4):e10687.
11. Issa N, Liddy WE, Samant S, et al. Emergency cricothyrotomy during the COVID-19 pandemic: how to suppress aerosolization. *Trauma Surg Acute Care Open.* 2020;5(1):e000542.
12. Roberts JR, Custalow CB, Thomsen TW. Cricothyrotomy and percutaneous translaryngeal ventilation. In: *Clinical Procedures in Emergency Medicine and Acute Care*. Philadelphia, PA: Elsevier, 2020:127–141.e3.
13. Cioffi WG, Asensio JA, Adams CA, et al. Chapter 3. Surgical airways: tracheostomy and cricothyroidotomy. In: Townsend CM and Evers BM (Eds), *Atlas of Trauma/Emergency Surgical Techniques*. Philadelphia, PA: Elsevier, 2014:23–34.
14. Stufflebeam DL. Guidelines for developing evaluation checklists: the checklists development checklist (CDC). 2000. Available at: https://wmich.edu/sites/default/files/attachments/u350/2014/guidelines_cdc.pdf. Accessed September 11, 2023.
15. Waggoner J, Carline JD, Durning SJ. Is there a consensus on consensus methodology? Descriptions and recommendations for future consensus research. *Acad Med.* 2016;91(5):663–8.
16. Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. *J Adv Nurs.* 2000;32(4):1008–15.
17. Walter SD, Eliasziw M, Donner A. Sample size and optimal designs for reliability studies. *Stat Med.* 1998;17(1):101–10.
18. Klein MR, Schmitz ZP, Adler MD, et al. Development of a rigorously designed procedural checklist for assessment of emergency medicine resident performance of temporary transvenous cardiac pacing. *AEM Educ Train.* 2021;5(3):e10566.
19. Zaidi HQ, Dhake SS, Miller DT, et al. Emergency department thoracotomy: development of a reliable, validated checklist for procedural training. *AEM Educ Train.* 2019;4(2):139–46.
20. McHugh ML. Interrater reliability: the kappa statistic. *Biochem Med (Zagreb).* 2012;22(3):276–82.

A Taste of Our Own Medicine: Fostering Empathy in Medical Learners Through Patient Simulation

Romy Portieles Peña, MD*
William Weber, MD, MPH†

*The University of Chicago Medical Center, Department of Internal Medicine, Chicago, Illinois
†Rush University Medical Center, Department of Emergency Medicine, Chicago, Illinois

Section Editor: Danielle Hart, MD, MACM
Submission history: Submitted June 11, 2025; Revision received October 10, 2025; Accepted October 10, 2025
Electronically published November 26, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI 10.5811/westjem.48535.

Introduction: Residents and medical students spend thousands of hours of medical education learning the physician's perspective but rarely find themselves on the other side of the stethoscope. In this study we evaluated whether a brief, novel curriculum of simulating the patient experience could improve medical learners' reported empathy for patients and ability to explain medical interventions.

Curricular Design: Fifty-eight medical learners (medical students and resident physicians) participated in a 50-minute didactic session where learners simulated patient experiences such as wearing a patient gown and cervical collar, walking with crutches, and tasting potassium chloride and thickened water. Learners evaluated their perceptions of the curriculum with a survey.

Impact/Effectiveness: Participants reported limited experience as patients, with 66.7% never having been hospitalized and 50% not taking any daily medications. Learners rated the curriculum highly on a seven-point Likert scale with 98% expressing it helped them to empathize with patients (90% either agreed or strongly agreed) and 95% expressing that it would help them explain interventions (81% either agreed or strongly agreed). There was no difference between medical students and residents regarding reported effect on empathy (M 6.24 vs 6.44; $P = .30$) or effect on ability to explain the intervention (M 6.06 vs 6.24; $P = .43$). This brief curriculum simulating the patient experience was well-received by medical student and resident learners, who overwhelmingly felt it improved their empathy for patients and explanations of common interventions. This approach to fostering empathy could help both medical student and resident learners, many of whom may have limited experience as a patient. [West J Emerg Med. 2025;26(6)1526–1529.]

BACKGROUND

Resident physicians and medical students receive extensive medical education focused on thinking like a physician. While trainees have significant clinical knowledge, many lack significant personal experience as a patient, with < 5% of those aged 18-24 years of age being hospitalized per year.[1] Curricular activities where learners simulate the patient perspective can potentially overcome trainees' gaps in patient experience. However, such studies have been limited. Some prior studies have maintained a very narrow focus, such as tasting various oral antibiotics or participating in a diabetic shopping experience.[2,3] While such activities can lead to increased empathy, the effects may not easily translate to other domains.

Other studies have involved longer interventions such as an overnight hospital stay or three-hour visit to the emergency department (ED).[4,5] While these broaden the spectrum of experiences encountered, they are very resource intensive for learners and may tax hospitals with limited bed capacity and education funding. A recent simulation-based study of residents role-playing as patients was rated favorably but without measurable improvements in empathy.[6] Empathy has been associated with increased patient satisfaction, patient adherence to plans, and improved

clinical outcomes.[7] We hypothesized that having learners undergo simulated patient interventions would improve reported learner empathy.

CURRICULAR DESIGN

In this study we piloted a brief patient simulation curriculum employing common but uncomfortable activities that exemplify a spectrum of medical experiences faced by patients. The curriculum was designed using Kern's six-step approach to curriculum development, with needs assessment from a group of five medical educators and 12 learners.[8] This needs assessment noted a lack of direct experience with the interventions that trainees were learning. Experiences were chosen to cover a broad variety of common medical interventions while also retaining a brevity that allowed for easy integration into existing didactics. We considered but did not pursue other interventions, such as tasting oral antibiotics (risk of side effects) or trying bilevel positive airway pressure (resource intensive).

We hypothesized that this curriculum would increase medical learners' reported empathy for their patients (primary outcome) and their perceived ability to explain these medical interventions (secondary outcome). This study consisted of a 50-minute didactic session where medical learners simulated patient experiences. Emergency medicine (EM) residents, internal medicine residents, and medical students were recruited to the study. A total of 58 learners participated: 33 medical students and 25 EM or internal medicine residents over the course of two separate days. This study was approved by the University of Chicago Institutional Review Board [IRB21-1203].

During the didactic session, learners were separated into two groups of 12-15 learners, each with an instructor. They followed an activity flow starting with donning patient gowns and taping intravenous tubing to their arms to simulate hospital garb (five minutes). Learners subsequently underwent a "trauma" station where they were fitted with cervical collars and then placed on a hard, trauma backboard with a simplified trauma roll performed by other learners (seven minutes). After the trauma roll, they were instructed to ambulate using crutches (five minutes). Finally, learners experienced a "per os station" where they were given 20 mL of thickened water and 20 mL of a typical potassium chloride oral solution to simulate dysphagia diet and potassium repletion, respectively (five minutes). As trainees transitioned between activities, instructors elicited learner experience and had a 2-3 minute debrief of each activity.

After completing all activities, learners filled out an anonymous survey regarding their perceptions of the curriculum and prior patient experience. Learners used a Likert scale to rate how they felt the study changed their empathy for and explanations to patients. Finally, the survey collected qualitative data focusing on learners' feelings during their time as "patients" and how the activity might impact their medical practice. After completing the survey, the trainees had a large-group debrief for approximately 10 minutes where they shared their experience and personal learning points. Learners were compensated with a $10 gift card for their participation.

We analyzed survey findings in Stata (StataCorp LLC, College Station, TX) and Microsoft Excel (Microsoft Corporation, Redmond, WA) using two-sample *t*-tests with Bonferroni correction. Qualitative data were coded using an inductive approach to generate themes with two coders. Discrepancies were discussed until coders agreed. A priori power analysis indicated that a sample of 32 participants would provide 80% power to detect a change of 20% in perceived empathy (Cohen $d = 0.8$, $\alpha = 0.05$), which was chosen as a de novo threshold. This study exceeded that sample size.

IMPACT / EFFECTIVENESS

A total of 58 learners participated in two separate sessions; 33 medical students and 25 residents, with equal male/female ratio, and all participants completed the survey. Participants reported limited experience as patients, with the majority never having been hospitalized and half taking no daily medications (Table 1).

Learners rated the curriculum highly on a seven-point Likert scale: 99% of participants expressed that the curriculum helped them to empathize with patients, with 90% either agreeing or strongly agreeing (Table 2); and 95% of learners reported that the session would help them better explain interventions to patients, with 81% either agreeing or strongly agreeing. There was no difference between medical students and residents regarding reported effect on empathy (M 6.24 vs

Table 1. Baseline demographic information of medical student/resident learners who participated in a didactic session that simulated patient experience.

Learner demographics	Count (percentage)
Training level	
Medical student	33 (57%)
Resident	25 (43%)
Sex	
Female	29 (50%)
Male	29 (50%)
Prior hospitalizations	
Never	38 (66%)
Once	15 (26%)
Twice	2 (3%)
≥ Three times	3 (5%)
Daily medication use	
Yes	29 (50%)
No	29 (50%)

Table 2. Survey findings of medical student/resident learners who participated in a didactic session that simulated patient experience.

This activity:	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly agree
Helps me empathize with patients	0	0	0	1 (2%)	5 (9%)	26 (45%)	26 (45%)
Helps me explain interventions to patients	0	0	0	3 (5%)	8 (14%)	25 (43%)	22 (38%)

6.44; $P = .30$) or ability to explain interventions (M 6.06 vs 6.24; $P = .43$). However, learners who had never been hospitalized prior to the study had a significantly higher reported increase in empathy compared to learners who had been previously hospitalized (M 6.47 vs 6.05; $P = .03$). There was no difference in reported improvement in explanations to patients between learners who had been hospitalized and those who had not (M 5.85 vs 6.29; $P = .06$). Of those who participated in the session, 97% reported they would change how they would describe interventions to patients based on their experience in the study.

Qualitatively, the two most common themes identified were 1) discomfort leading to reconsideration of interventions; and 2) empathy toward what the patients were experiencing (Table 3). A representative quote of these two changes was as follows: "[The study] will help me prepare patients for uncomfortable parts of their hospitalization and be conscious about when I can back off on uncomfortable interventions."

LESSONS LEARNED

We devised a learner handout with the station flow and instructions, which helped learners track their progress. Speech/swallow staff generously provided liquid thickening mix, and hospital pharmacists provided potassium chloride. Learners had the option to change into gowns in the bathroom or don gowns over their clothes. None chose to fully change, which facilitated a discussion about patient vulnerability. When learners had emotional responses to the stimuli, it helped to empathize and then remind them of the shift in magnitude as a patient: "Now imagine you have to drink thickened water every single day from now on." The one-hour duration was feasible to implement during weekly didactics, and the various stations could support small-group rotations with floating instructors.

This was a single-center study focused on perceived changes in empathy. This study only used a post-survey, which could have led to response shift or recall bias. Future iterations could evaluate higher levels on the Kirkpatrick model to establish improved communication or change in practice. The questions of the validated Jefferson Scale of Empathy had a focus beyond the scope of this intervention but could be considered as a future measure.

Table 3. Qualitative themes in survey of participants in a didactic session that simulated patient experience.

Themes identified	Example	Percentage of learners noting theme
Discomfort with interventions	"The C-collar is really uncomfortable."	57%
Empathy toward patients	"Opened my eyes to the challenges of being a patient"	24%
Vulnerability	"It made me feel vulnerable and uncomfortable."	10%
Gratitude	"I feel appreciative of my health."	5%

Address for Correspondence: William Weber, MD, MPH, Rush University Medical Center, Department of Emergency Medicine, 1750 W. Harrison St, Kellogg 103, Chicago, IL 60612. Email: william_weber@rush.edu.

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Peña et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. National Center for Health Statistics. Table HospStay. People with hospital stays in the past year, by selected characteristics: United States, selected years 1997-2019. 2023. Available at: https://www.cdc.gov/nchs/data/hus/hus20-21.pdf Accessed September 14, 2025.
2. Trujillo JM, Hardy Y. A nutrition journal and diabetes shopping experience to improve pharmacy students' empathy and cultural competence. *Am J Pharm Educ*. 2009;73(2):37.
3. Gee SC, Hagemann TM. Palatability of liquid anti-infectives: clinician and student perceptions and practice outcomes. *J Pediatr Pharmacol*

Ther. 2007;12(4):216-23.

4. Wilkes M, Milgrom E, Hoffman JR. Towards more empathic medical students: a medical student hospitalization experience. *Med Educ*. 2002;36(6):528-33.
5. Nelson S, Germann C, MacVane C, et al. Intern as patient: a patient experience simulation to cultivate empathy in emergency medicine residents. *West J Emerg Med*. 2018;19(1):41-8.
6. Culhane A, Martin J, Huston Z, et al. Simulating empathy: a qualitative experiential study of embedded resident learners in an empathy curriculum. *AEM Educ Train*. 2024;8(2):e10957.
7. Derksen F, Bensing J, Lagro-Janssen A. Effectiveness of empathy in general practice: a systematic review. *Br J Gen Pract*. 2012;63(606):e76-84
8. Singh MK, Gullett HL, Thomas PA. Using Kern's 6-step approach to integrate health systems science curricula into medical education. *Acad Med*. 2021;96(9):1282-90.

Effectiveness of a Collaborative, Virtual Outreach Curriculum for 4th-Year EM-bound Students at a Medical School Affiliated with a Historically Black College and University

Cortlyn Brown, MD, MCSO*
Richard Carter, MD[†]
Nicholas Hartman, MD, MPH[‡]
Aaryn Hammond, MD[‡]
Emily MacNeill, MD*
Lynne Holden, MD[§]
Ava Pierce, MD[‖]
Linelle Campbell, MD[§]
Marquita Norman, MD, MBA[‖]

*Atrium Health Carolinas Medical Center, Department of Emergency Medicine, Charlotte, North Carolina
[†]Howard University, College of Medicine, Washington, DC
[‡]Wake Forest University, School of Medicine, Winston-Salem, North Carolina
[§]Albert Einstein College of Medicine, Montefiore Medical Center, Bronx, New York
[‖]UT Southwestern Medical Center, Dallas, Texas

Section Editors: Matthew Tews, MD and Christine Stehman, MD
Submission history: Submitted January 24, 2024; Revision received October 9, 2024; Accepted October 17, 2024
Electronically published December 16, 2024
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.18748

Background: Diversity within the physician workforce is associated with improved clinical outcomes and patient satisfaction. Despite this, the US physician workforce, particularly in emergency medicine (EM), remains relatively homogeneous. Of all Black medical school students in the US, 14% attend the four Historically Black Colleges and Universities (HBCU) that have a medical school. Unfortunately, none of these schools are affiliated with an academic EM program. Because of this, there is less professional mentorship focused on obtaining a career in EM and potentially less formal curricula for senior medical students doing their home sub-internship in EM.

Objectives: Our objective was to fill the gap left by the absence of an academic EM department at Howard University College of Medicine (HUCOM) by creating a collaborative educational experience for fourth-year medical students during their home EM sub-internship. The curricular objectives were to teach core principles of EM, build relationships with students, and prepare them for pursuing EM residency training.

Curricular Design: Four EM academic departments collaborated to create and implement a virtual curriculum using the six-step approach to curricular development.

Impact/Effectiveness: After completion of the course, five students (100%) reported strongly agreeing with the following statements. These sessions 1) helped me learn the approach to core EM topics more than I would have been able to do on my own; 2) helped me learn key skills for excelling in an EM rotation more than I would have been able to do on my own; and 3) allowed me to connect with faculty and resident mentors to learn more about the field of EM. Of these five students, 80% and 20% reported strongly agreeing and agreeing, respectively, that these sessions helped them learn about the process of applying to and selecting an EM residency program. [West J Emerg Med. 2025;26(1)129–134.]

INTRODUCTION

Need for Innovation

Medical students interested in emergency medicine (EM) who attend a historically Black college or university (HBCU) do not have the teaching and mentorship that occurs when a medical school is affiliated with an academic EM program. We formed a collaborative program among four academic EM departments to help fill this need for EM-bound students at Howard University College of Medicine (HUCOM). To our knowledge, this is the first such program to be reported in the literature.

Background

A diverse physician workforce is associated with increased access to and utilization of the healthcare system, improved health outcomes and patient experience, and improved fiscal margins for hospitals.[1–4,4–6] Despite this, the medical field as a whole has made minimal advances in increasing physician diversity. In 2008 the percentage of Black or Hispanic US physicians from all specialties was 6.3% and 5.5%, respectively. By 2018, however, those percentages were only 5.0% and 5.8%, respectively. Even more concerning given the diverse patient population that the emergency department (ED) serves, EM remains among the medical specialties with the lowest number of physicians from backgrounds under-represented in medicine (URiM). Between 2008–2018, the percentage of emergency physicians who identified as Black decreased from 5.0% to 4.5%, and stayed constant at 5.3% for Hispanic/Latinos.[7]

When surveyed, 35% of EM program directors reported that the small number of URiM residency applicants was the greatest barrier to obtaining a diverse residency class.[8] Of all Black medical school students in the US, 14% attend four HBCUs with a medical school. Because none of these schools are affiliated with an academic EM program, their medical students have decreased exposure to EM in the pre-clinical years, less professional mentorship focused on obtaining a career in EM, and fewer formal curricula for senior medical students doing their home sub-internship (sub-I) in EM. This lack of mentorship has been identified as a critical barrier for URiM students across various specialties, contributing to lower application rates and residency placement. Studies suggest that mentorship increases both career satisfaction and inclusivity and the likelihood of these students entering and succeeding in competitive fields like EM.[9,10] In addition, a national survey of clerkship directors found that having a structured, standardized sub-I curriculum significantly improved the preparedness of students for residency, especially when these rotations were affiliated with residency programs.[11]

The Emory University Department of Emergency Medicine created a program with Morehouse School of Medicine to provide guidance to medical students interested in EM. A total of 115 Morehouse students completed an EM clerkship at Emory, and 62.6% successfully matched into EM.[12] While this program was successful, students typically rely on their home sub-I to prepare for mandatory away rotations. This absence of support from an academic department prior to away rotations may cause the students to find themselves less prepared and at a competitive disadvantage when they begin their away rotations. Furthermore, many EM residencies are not in proximity to a HBCU, requiring students to bear the financial burden of traveling to other cities and states for their away rotations.

At HUCOM, the EM sub-I relied heavily on an older, recorded online lecture series from an external institution, supplemented by bedside teaching from community attendings at one site, Howard Hospital. Students noted that the absence of formal educational components, such as weekly didactics, journal clubs, and simulation, resulted in limited exposure to "cutting-edge" EM practices. Moreover, the lack of interaction with academic attendings who are dedicated to medical student education, along with the absence of residents—who represent the next step in career progression—left students without access to critical mentorship and guidance. This gap hindered students' ability to visualize their own progression and receive practical advice from individuals at a similar stage in training, further limiting their connection to the broader EM community.

To help overcome that barrier, we created a collaboration between four academic EDs and HUCOM in an attempt to augment curricular offerings for EM-interested students on their HUCOM fourth-year EM home rotation. The collaboration between four academic EDs broadens the exposure students receive to different teaching styles, institutional cultures, and clinical perspectives. This variety provides a more comprehensive educational experience than what can be offered by a single institution alone.

Objective of Innovation

We aimed to address the absence of an academic ED at HUCOM by developing a collaborative educational experience. This program focuses on core principles of EM and residency preparation and was designed specifically for fourth-year medical students during their home EM sub-I at HUCOM. We obtained institutional board review approval from Wake Forest University School of Medicine.

Development Process

We used the six-step approach to curricular development. All final curricular design and content was agreed upon by the faculty representatives at each of the four participating residency sites.[13,14] 1) *Problem identification and general needs assessment.* Unlike traditional curriculum development where the need assessment is based on a specific health problem, our needs assessment was based on the need to increase the diversity of emergency clinicians by helping prepare under-represented students to succeed in away

rotations and the match. 2) *Determining and prioritizing content.* While individuals at each participating institution were involved with teaching at their own institution, the needs of the HUCOM students were unique. Therefore, educational objectives were developed in conjunction with the faculty advisor to the fourth-year EM rotation at HUCOM who conducted stakeholder interviews with five current medical students and five alumni who had recently graduated and were currently in EM residencies across the country. It was decided that curricular content would include a mix of core EM topics (as determined from stakeholder interviews) and advising sessions.

After all sessions, students were provided with the contact information for the faculty lecturers and were encouraged to reach out. 3) *Goals and objectives*. Broad curricular goals were developed. These were to a) teach the approach to core complaints in EM; b) teach key skills in EM; c) demystify the process of applying to an EM residency program; and d) connect students with residents and faculty in the field of EM. After this, specific measurable lecture goals were developed based on cognitive, affective, and psychomotor objectives for the learner. 4) *Educational strategies*. We created an entirely virtual, four-week didactic program, with content organized into weekly four-hour blocks, each led by a different academic ED, on an interactive platform that allowed for case-based discussions, small-group discussions, and standard lecture format. Since implementation in 2022, the program has been mandatory for all students completing their fourth-year EM sub-I at HUCOM.

Each week, the sessions required the participation of four to five faculty members who volunteered their time, with the majority of lectures delivered by a single faculty member. However, select sessions, such as the "Application and Interviewing Process," were co-led by a dynamic team consisting of the assistant program director, program director, and chief residents, providing a well-rounded perspective and valuable insights for the participants. Content was mapped and coordinated, and pre-reading was assigned from the Academy for Diversity and Inclusion in Emergency Medicine webinar series "How to Be a Successful EM Applicant" and the Clerkship Directors in Emergency Medicine/Society of Academic Emergecy Medicine M4 curriculum. Each day included a mix of clinical topics and "advising" sessions (Table 1). 5) *Implementation.* Approval from the EM director was obtained, and the curricula was implemented. 6) *Evaluation and feedback*. After each block of content, evaluations for each individual session (including the presenter) were sent to participating students via REDCap (Research Electronic Data Capture, hosted at Howard University School of Medicine.

These evaluations consisted of one question for each session: "Please rate the effectiveness of the following session in accomplishing its learning objectives: *Session, Presenter*." At the end of the month-long program, an overall evaluation of the program was sent to participating students, also via RedCap. The program evaluation survey tool, including four multiple-choice questions regarding the overall learning objectives, is reflected in Figure 1. The tool also included two free-response questions: 1) "Which parts of the curriculum were of most value to you?"; and 2) "Which parts of the curriculum could be improved?" We refined the curricula each year during an end-of-year debrief.

Implementation Phase

Prior to the first session, students were provided a spreadsheet with pre-session work, curriculum topics, presenting faculty and residents, dates and times, and links to access the weekly virtual sessions. Each EM program provided four hours of interactive didactics to the students according to the scheduled dates and times.

Outcomes

A post-curricular survey found universal agreement from students that the curriculum was effective in meeting the above goals. Of the five students, 100% reported strongly agreeing with the following statements. These sessions 1) helped me learn the approach to core EM topics more than I would have been able to do on my own; 2) helped me learn key skills for excelling in an EM rotation more than I would have been able to do on my own; and 3) allowed me to

Table 1. Curricula from sample block.

	Didactic session one Institution one	Didactic session two Institution two	Didactic session three Institution three	Didactic session four Institution four
Lecture topics	Personal statement	Presentation skills	How to choose the right program for you	Application and interviewing process
	Chest pain	Altered mental status	Toxicology overview	Headache
	Shortness of breath	Abdominal pain	Shock and sepsis	Gynecologic and urologic emergencies
	Radiographs	Electrocardiogram introduction	Vaginal bleeding	Endocrine and electrolytes
	Social emergency medicine	Ultrasound basics	Advanced trauma life support	Advanced cardiac life support, basic life support

Session:
Presenter:

Please rate the effectiveness of the following session in accomplishing its learning objectives on a scale from 1 (not effective) to 5 (very effective)

Questions	These sessions helped me learn the approach to core emergency medicine topics (abdominal pain, chest pain, headache, etc.) more so than I would have been able to do on my own.	These sessions helped me learn key skills for excelling in an emergency medicine rotation including oral presentations, EKG interpretation, x-ray interpretation and ultrasound, more so than I would have been able to do on my own.	These sessions helped me learn about the process of applying to and selecting an EM residency program.	These sessions allowed me to connect with faculty and resident mentors to learn more about the field of emergency medicine.
Response Options	Strongly agree, agree, neutral, disagree, strongly disagree	Strongly agree, agree, neutral, disagree, strongly disagree	Strongly agree, agree, neutral, disagree, strongly disagree	Strongly agree, agree, neutral, disagree, strongly disagree
Response				

Which parts of the curriculum were of most value to you?

Which parts of the curriculum could be improved?

Figure 1. Evaluation form sent to students after each session.

connect with faculty and resident mentors to learn more about the field of EM. Of the five students, 80% and 20% reported strongly agreeing and agreeing, respectively, that these sessions helped them learn about the process of applying to and selecting an EM residency program.

Narrative feedback, such as the quotes below, from students highlighted the value of meeting with faculty and residents from different programs. from going through cases in real time.

> Meeting the faculty and program directors at various EM programs really was the highlight of the curriculum. It was great to get an inside look at each program and learn more about their culture, approach, and the people there.

> I really enjoyed hearing the residents' perspective on how to navigate the application process.

Narrative feedback, such as the quotes below, also emphasized the value of the curriculum's interactive nature and how traditionally in-person topics were effectively adapted for virtual learning.

> My favorite part was participating in real-time cases. Being involved as the case unfolded felt like hands-on practice.

> It was incredible to have the mechanisms of ultrasound explained in such detail. Breaking it down to the basics really helped me understand ultrasound for the first time.

REFLECTIONS AND LESSONS LEARNED

Engagement of the Home Institution

Successful implementation required active engagement from HUCOM, specifically the clerkship director and administrative staff, who served as lead contacts. Control over rotation scheduling was essential to ensure all students were fully engaged in the sessions. In addition, as participating institutions used various online platforms to communicate and disseminate curricula materials, such as *Tintinalli's Emergency Medicine*, with their students, it was necessary to have HUCOM manage a central communications- and video-conferencing platform that was accessible to all lecturing institutions and participating students.

Engagement of Collaborating Institutions

Recruiting faculty and residents for each institution's week was challenging, but having representatives with strong connections in medical education made a significant difference. These relationships allowed them to quickly and effectively recruit lecturers, leveraging their networks to secure individuals who were both willing and enthusiastic to participate. This highlights the value of having institutional leads with established ties to their educational infrastructure, streamlining the recruitment process.

Collaborative Power

The success of this project involved a high degree of trust as many of the institutional representatives had not worked together. To develop this trust, we followed the framework of engaging, listening, framing, envisioning, and committing.[15] The power of this program is truly in the collective rather than the individual. While students could learn about atrial fibrillation from one institution, the real learning occurs when they see the collaboration, get a sense of the scope of EM as a professional field, and are able to interact with varied institutions that have different approaches to teaching and the practice of medicine.

Challenges with Small Student Cohorts

Unlike traditional EM rotations that attract students from across the country, our program had a small cohort comprised solely of HUCOM students, as there was no affiliated residency. This small group size meant that if one student missed a session due to interviews, illness, or other reasons, it noticeably impacted the learning environment, limiting group dynamics and peer-to-peer learning.

Program Limitations and Adaptations

Virtual learning posed challenges for teaching interactive skills such as ultrasound. We addressed this by incorporating case-based learning with curated image libraries and real-time feedback. To further enhance the learning experience, future iterations should explore the integration of ultrasound simulation software to better mimic hands-on scenarios.

Scalability and Expansion

Although initially designed for HUCOM students, this model could be expanded to other medical schools without academic EDs, especially those with a high proportion of URiM students. With the opening of additional HBCU medical schools, there is an even greater need for programs that increase access to EM education.

Limitations

Study limitations include the small sample size as well as lack of a comparison group. Future analyses will address these limitations and include evaluation of match outcomes as well as other learner-centered targets such as performance in Standardized Letters of Evaluation or subsequent rotations and intern year performance.

Address for Correspondence: Cortlyn Brown, MD, MCSO, Atrium Health Carolinas, Department of Emergency Medicine, 1000 Blythe Blvd., Charlotte, NC 28203. Email: Cortlyn.Brown@atriumhealth.org

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Brown et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Komaromy M, Grumbach K, Drake M, et al. The role of Black and Hispanic physicians in providing health care for underserved populations. *N Engl J Med.* 1996;334(20):1305–10.
2. Marrast LM, Zallman L, Woolhandler S, et al. Minority physicians' role in the care of underserved patients: diversifying the physician workforce may be key in addressing health disparities. *JAMA Intern Med.* 2014;174(2):289.
3. Gomez LE and Bernet P. Diversity improves performance and outcomes. *J Natl Med Assoc.* 2019;111(4):383–92.
4. Saha S, Komaromy M, Koepsell TD, et al. Patient-physician racial concordance and the perceived quality and use of health care. *Arch Intern Med.* 1999;159(9):997.
5. Takeshita J, Wang S, Loren AW, et al. Association of racial/ethnic and gender concordance between patients and physicians with patient experience ratings. *JAMA Netw Open.* 2020;3(11):e2024583.
6. Shen MJ, Peterson EB, Costas-Muñiz R, et al. The effects of race and racial concordance on patient-physician communication: a systematic review of the literature. *J Racial Ethn Health Disparities.* 2018;5(1):117–40.
7. Garrick JF, Perez B, Anaebere TC, et al. The diversity snowball effect: the quest to increase diversity in emergency medicine. A case study of Highland's emergency medicine residency program. *Ann Emerg Med.* 2019;73(6):639–47.
8. Boatright D, Tunson J, Caruso E, et al. The impact of the 2008 Council of Emergency Residency Directors (CORD) panel on emergency medicine resident diversity. *J Emerg Med.* 2016;51(5):576–83.
9. Mabeza RM, Christophers B, Ederaine SA, et al. Interventions associated with racial and ethnic diversity in US graduate medical education: a scoping review. *JAMA Netw Open.* 2023;6(1):e2249335.
10. Martinez J, Mieres JH, Roswell RO, URiM (underrepresented in medicine) learner and faculty mentoring. In: Fornari A and Shah DT

(Eds.), *Mentoring in Health Professions Education (34–43). IAMSE manuals*. Cham, Switzerland: Springer International Publishing, 2021.

11. De La Cruz MSD, Sairenji T, Stumbar SE, et al. Curricular recommendations for a national family medicine subinternship: a qualitative analysis from multiple stakeholders. *Fam Med.* 2021;53(10):835–42.
12. Goines J, Iledare E, Ander D, et al. A model partnership: mentoring underrepresented students in medicine (URiM) in emergency medicine. *West J Emerg Med.* 2021;22(2):213–7.
13. Sweet L and Palazzi D. Application of Kern's six-step approach to curriculum development by global health residents. *Educ Health.* 2015;28(2):138.
14. Thomas PA, Kern DE, Hughes MT, et al. (Eds.). *Curriculum Development for Medical Education: a Six-step Approach*. 3rd Ed. Baltimore, Maryland: Johns Hopkins University Press, 2016.
15. Maister D, Green C, Gaiford R. *The Trusted Advisor.* New York New York: Simon & Schuster, 20th Anniversary Ed., 2021.

A 30-year History of the Emergency Medicine Standardized Letter of Evaluation

Jenna S. Hegarty, BS*
Cullen B. Hegarty, MD†
Jeffrey N. Love, MD, MHPE‡
Alexis Pelletier-Bui, MD§
Sharon Bord, MD‖
Michael C. Bond, MD#
Samuel M. Keim, MD, MS**
Kevin Hamilton, BS††
Eric F. Shappell, MD, MHPE‡‡

*Rosalind Franklin University of Medicine and Science, Chicago, Illinois
†University of Minnesota Medical School, HealthPartners Institute/Regions Hospital, Department of Emergency Medicine, St. Paul, Minnesota
‡Georgetown University School of Medicine, Department of Emergency Medicine, Washington, DC
§Cooper Medical School of Rowan University/ Cooper University Hospital, Department of Emergency Medicine, Camden, New Jersey
‖The Johns Hopkins University School of Medicine, Department of Emergency Medicine, Baltimore, Maryland
#University of Maryland School of Medicine, Department of Emergency Medicine, Baltimore, Maryland
**University of Arizona, Department of Emergency Medicine, Tucson, Arizona
††University of Maryland Medical System Center for Technology Innovation, Baltimore, Maryland
‡‡Massachusetts General Hospital / Harvard Medical School, Department of Emergency Medicine, Boston, Massachusetts

Section Editor: Jules Jung, MD, MEd
Submission history: Submitted April 30, 2025; Revision received November 6, 2025; Accepted November 3, 2025
Electronically published November 26, 2025
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI 10.5811/westjem.47110

Thirty years ago, education leaders in emergency medicine (EM) developed a standardized letter of recommendation to address limitations of narrative letters of recommendation in the residency selection process. Since then, multiple iterations and improvements with specialty-wide adoption have led to this letter being cited as one of the most essential pieces of a residency application. Based on the experience and success in EM, many other specialties have also now adopted standardized letters of their own. In this paper, we detail the 30-year history of the EM standardized letter including form changes and technological innovations, research and validity evidence, and discussion of research and administrative priorities for the future. [West J Emerg Med. 2025;26(6)1544–1548.]

INTRODUCTION

Emergency medicine (EM) was the first specialty to adopt a standardized letter for residency applications. Noting the shortcomings of narrative letters of recommendation featuring lengthy descriptions and heterogenous content and structure, the Council of Residency Directors in Emergency Medicine (CORD) assembled a task force in 1995 to develop a structured assessment to replace narrative letters that was standardized, concise, and discerning.[1] The resulting assessment form became the Standardized Letter of Recommendation (SLOR) and debuted in the 1995-1996 EM residency application cycle.

Over the past 30 years, the EM standardized letter has evolved through multiple iterations and advancements including updates to the items and domains assessed, migrating from disseminated paper forms to a centralized electronic database, and development of form variants for subspecialty and off-service rotations. Now known as the Standardized Letter of Evaluation (SLOE),[2] the EM SLOE has led the way for other specialties that recognized the strength of this approach and developed their own standardized letters of evaluation in subsequent years, such as plastic surgery in 2012, internal medicine and orthopedic surgery in 2017, obstetrics and gynecology in 2022, and more.[3-6] Additionally, the Coalition for Physician Accountability's Undergraduate Medical Education-Graduate Medical Education Review Committee recommended in 2021 that all specialties develop and move to structured evaluation letters instead of narrative letters.[7]

In this paper, we detail the 30-year history of the EM SLOE including form changes and technological innovations in response to evolving needs and priorities of the broader EM community. This history and accompanying context can inform efforts of those responsible for developing, researching, writing, and interpreting SLOEs by standardizing the language used to describe SLOE versions and variants,

summarizing the literature on the topic, and mapping research and administrative agendas for the future.

STANDARDIZED LETTER VERSIONS

The first version of the EM standardized letter, the SLOR, was produced in 1995 by a task force commissioned by CORD (Table 1).[1] This letter debuted in the 1995-1996 residency application cycle and featured sections assessing qualifications for EM (commitment, work ethic, ability to formulate a differential and plan, personality) in addition to a global assessment, estimated match list position, and comments (Appendix 1A).From 1995-2011 the SLOR became an influential aspect of the EM residency match process, and the original letter format was iterated upon.[8]

In 2011, CORD re-established the SLOR task force to study, re-evaluate and update the letter.[8-10] The result was the second official version of the letter, the 2012 SLOE (Table, Appendix 1B), which debuted in the 2012-2013 residency application cycle. At this time, the name SLOR was changed to SLOE to better represent that the letter's purpose was not necessarily to recommend a student, but rather to provide a standardized evaluation of their performance. In addition to the name change came additions and edits to the letter, such as asking which EM rotation this was for the student and the dates during which the student rotated. In Part B, "Qualifications for EM," the personality question was removed, and questions were added regarding ability to work with a team, ability to communicate a caring nature to patients, and anticipated guidance during residency. The anchors in this section also moved away from adjectives and toward peer comparison. In Part C, "Global Assessment," Question 2 changed the rank-list options from descriptions of likelihood of matching to numeric anchors (eg, "Top 10%"). Question 2 also added a clarifying question, "Are you on the committee that determines the final rank list?" to understand whether the letter writer had experience with such rankings. Lastly, the narrative section now had a reduced word limit of 250 words or less to encourage letter writers to be more concise, and to decrease the common practice of advertising the institution where the rotation was completed.

Throughout the time spanning these first two iterations of the standardized letter, some authors customized or changed the form.[8] This variance weakened the SLOE by straying from one of its core tenets: standardization. Many efforts from 2011–2016 were made by the SLOE task force to increase standardization and prevent customization such as providing author guidelines and training (including lectures, workshops, and discussion groups), and advocating for a non-modifiable electronic template.[9] To further promote standardization in the use of the SLOE, an electronic portal to write and save letters was developed in 2016, in addition to a new letter form referred to as the electronic SLOE (eSLOE) (Table, Appendix 1C).[11] This change ensured that no alterations could be made to the form, thus standardizing SLOE data for review and comparison. This form also introduced a section after the narrative to describe the institution, both to provide context for the reader and preempt the use of the narrative to describe institutional characteristics. Additionally, the eSLOE website saved all letter information. It produced copies in the correct format, making uploading to the Electronic Residency Application Service system easier for authors, and establishing an electronic database amenable to research and quality improvement initiatives.

To allow authors to provide context for the unprecedented pandemic conditions of the 2020 and 2021 application cycles, the SLOE committee added a single narrative question to the evaluation asking how the student's rotation was affected by COVID-19. While this change technically makes the 2020 edition of the eSLOE a different version of the standardized letter (Table, Appendix 1D), it is otherwise the same 2016 eSLOE.

Following the addition of the COVID-19 question in 2020, the SLOE committee again re-evaluated and updated the eSLOE resulting in the 2022 electronic SLOE 2.0 (eSLOE 2.0) (Table, Appendix 1E).[12] The most notable change in the 2022 eSLOE was the addition of criterion-referenced items and removal of some norm-referenced items. This transition was made in step with broader trends in medical education toward assessments that compare performance to a standard as opposed to other trainees. Another competency-based assessment for EM students in use at that time, the National Clinical Assessment Tool for Medical Students in Emergency Medicine (NCAT-EM),[13] provided helpful context as a field-tested, criterion-referenced clinical assessment to emulate in the 2022 eSLOE.[14,15] A question was added to provide more insight into the sources of information used in compiling the SLOE. Authors could also denote whether this evaluation was based on a rotation taken by all students at the letter writers' institution or just by EM sub-interns, as each would presumably result in a different grading breakdown. There was also the ability to denote any changes in grading practices to inform comparisons of grades across years. With the transition of US Medical Licensing Exam Step 1 scores to pass/fail and more institutions moving to pass/fail curricula, the SLOE committee added a section regarding test-taking ability, identifying any standardized testing completed during the rotation (eg, National Board of Medical Examiners shelf exam, Society of Academic Emergency Medicine tests, or home- grown assessment).

Given the growing number of SLOE iterations, it is important to standardize the nomenclature to improve clarity in discussions and future literature on this topic. When referring to these evaluations generally and inclusive of SLOR and SLOE versions, we propose reference to the emergency medicine *standardized letter*. When referring to specific versions of the EM standardized letter, we propose referring to the year the version was first used in practice and either SLOR or SLOE, as appropriate (eg, 1995 SLOR,

2016 SLOE). Modifiers to further distinguish versions (eg, 2016 eSLOE or 2022 eSLOE 2.0) may also be used; however, we recommend still including the year in these cases to avoid potential misunderstanding via errors of omission (eg, omitting "2.0" from "eSLOE 2.0" for brevity or by mistake could lead to the reader interpreting this as the 2016 version when the 2022 version was intended, whereas "2022 eSLOE" is unambiguous).

STANDARDIZED LETTER VARIANTS

From the use of the SLOR through the 2016 SLOE, writers and reviewers began to identify and report to CORD leadership opportunities where clearer differentiation between types of authors and rotations would be beneficial for writers, reviewers, and researchers. These opportunities for clearer differentiation resulted in the creation of multiple SLOE variants. In 2016, the SLOE for Non-Residency-based EM Physicians was introduced (Table 1). This variant removed the item requiring authors to describe where the candidate would reside on their rank list, noting that this question was inappropriate for physicians not involved in a residency program. This new form allowed students to still receive evaluations from this group of authors but provided additional context for reviewers by clearly describing the source of the letter. Additionally, this separation facilitated more granular data for research and quality assurance initiatives. Also released in 2016, the subspecialty SLOE extended evaluation opportunities to include EM subspecialists in toxicology, ultrasound, pediatric EM, and emergency medical services (Table).

The COVID-19 pandemic in 2020 prompted significant restrictions on visiting clerkships nationwide, resulting in limited opportunities for students to receive outside SLOEs. To create more opportunities for students to receive standardized letters in the absence of additional EM clerkship availability, the Off Service Standardized Letter of Evaluation (O-SLOE) was developed (Table 1, Appendix 2G). The O-SLOE expanded access to standardized letters from off-service faculty in non-EM specialties. At this time a question regarding COVID-19 was also added to both the subspecialty SLOE and the SLOE for non-academic emergency physicians (Table 1, Appendix 2A, 2D).

All three variants of the SLOE were updated by the CORD SLOE Committee again in 2022 to match the updated 2022 SLOE (Table , Appendix 2B, 2E, 2H). The variants were also added to the eSLOE database at that time. The latest addition to SLOE variants in 2024 was a bar at the top of each PDF with a unique color to signify each variant, making it clear to SLOE readers which type of SLOE variant they were reading (Table, Appendix 2C, 2F, 2I).

RESEARCH

Highlights of SLOE research from author experience and PubMed search for "standardized letter of evaluation" include a broad scope of topics. Past research has highlighted the SLOE's value as one of the most heavily weighted aspects of an applicant's file.[9,13,16] When compared to narrative letters of recommendation, the EM SLOE was interpreted faster by recruitment committees and had higher interrater reliability.[17]

Research investigating the process of how SLOEs are written has noted an increasing proportion of SLOEs authored by groups compared to those authored by individuals.[18] Program directors in EM have cited increased trust of group SLOEs compared to those authored by individuals despite limitations noted in past analysis of group SLOE-authorship processes.[8,9,19] This may be due to slight but statistically significantly higher ratings seen in individual SLOEs compared to group SLOEs, which some may interpret as grade inflation in individual SLOEs. It is worth noting, however, that these score differences are smaller and even reversed when comparing only individual SLOEs written by clerkship directors to group SLOEs, suggesting that clerkship directors authoring individual SLOEs exhibit little to no grade inflation compared to group SLOE authors.[18] Data presented at the 2025 CORD Academic Assembly also has linked the quantity of SLOEs authored per year with rating trends, noting that lower volume SLOE author(s) gave higher mean ratings compared to high-volume author(s) for both individual and group SLOEs.[20]

Trends in ratings by writer experience and home vs away rotations have also been explored, noting higher ratings in less experienced writers and home rotations.[21,22] While it is encouraging that high-volume author(s) and clerkship director ratings are similar to group SLOE ratings on average, optimizing standardization of ratings across all author types remains a potential growth area for the SLOE. Form updates and consistent messaging and training efforts through CORD have been shown to decrease evidence of rating leniency,[11] as has defaulting score selections to the midpoint of the range and creating a pop-up notification for when score extremes are selected[23]; however, recent evidence suggests persistence of variable rating practices across institutions that warrants continued efforts in this area.[24]

The competitiveness of applicants based on SLOE information has also been explored through the lenses of simultaneous goals of (1) optimizing match outcomes for applicants and (2) providing programs with stratifying performance information. Analysis of match outcomes for applicants with lower ratings in one study shows increased risk of not matching, but lower ratings did not preempt a successful match.[25] Another study noted that adherence to rating standards did not seem likely to increase risk of applicants failing to match in EM.[26] Both of these studies support the notion that whole rating scales can and should be used, although with consistency and transparency to decrease the risk that authors see lower rankings as outlier red flags, which has been described in a qualitative study investigating how SLOEs are interpreted.[19]

Multiple recent studies demonstrate a high degree of faculty consensus regarding the level of competitiveness of an applicant based on the SLOE.[13,27,28] These studies also show promise for algorithms to predict consensus levels of competitiveness. These models outperformed artificial intelligence software when comparing their ability to predict faculty consensus rankings of competitiveness.[29] How these algorithms can be operationalized to improve the application process is an ongoing area of discussion, but this could involve applicant-facing applications such as broad competitiveness feedback to tailor application quantity and breadth, or program-facing applications such as competitiveness estimations to which faculty ratings could be compared to assess for potential bias or to cut down on time needed for reviews.

There have been limited investigations into the association of SLOE ratings with future performance.[30–32] Published studies face challenges of small sample sizes and use of unvalidated outcome measures in two studies. In the study assessing the association between SLOE and Accreditation Council for Graduate Medical Education (ACGME) Milestones ratings, only one year of Milestones data was used, which limits the scope of these results.[31] National data presented at the 2025 ACGME conference, however, shows a clear association between algorithm-derived SLOE competitiveness and multiple measures of residency Milestones performance including mean first and last Milestone ratings by competency and the binary outcome of residency completion.[33] Future SLOE research should continue to prioritize studies linking SLOE ratings to future performance.

While many strengths of the EM standardized evaluation have been discovered, areas for improvement have also been identified. Literature suggests that both sex-based and racial bias are demonstrated in certain components of the eSLOE.[34–36] There is also evidence that institutional rating patterns and adherence to written standards vary widely, which has raised long-standing concerns about grade inflation and its impact on the ability to stratify applicant performance.[8,11,24,26,37,38] Additionally, a review of validity evidence for the 2016 SLOE highlights areas of improvement to consider, although more recent research has addressed some of these concerns.[39]

NEXT STEPS

Emergency medicine has led the field in standardized letters for the residency application process for the past 30 years. Looking forward to how EM can lead in the next 30 years, several areas stand out. These areas include mitigating the influence of bias on standardized letter of evaluation assessments, continuing to adapt the SLOE instructions, questions, data points, and form to improve response processes and data quality (including efforts to curb, or at least track and facilitate adjustment for, grade inflation), and further bolstering the validity evidence for the SLOE through research including measuring the association of SLOE ratings with future performance.

Address for Correspondence: Eric F. Shappell, MD, MHPE, Harvard Medical School/ Massachusetts General Hospital, Department of Emergency Medicine,125 Nashua St. Room 2426, Boston, MA 02114. Email: eshappell@mgh.harvard.edu.

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. No author has professional or financial relationships with any companies that are relevant to this study. There are no conflicts of interest or sources of funding to declare.

Copyright: © 2025 Hegarty et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: http://creativecommons.org/licenses/by/4.0/

REFERENCES

1. Keim SM, Rein JA, Chisholm C, et al. A Standardized letter of recommendation for residency application. *Acad Emerg Med*. 1999;6(11):1141-6.
2. Garmel GM, Grover CA, Quinn A, et al. Letters of recommendation. *J Emerg Med*. 2019;57(3):405-10.
3. Alweis R, Collichio F, Milne CK, et al. Guidelines for a standardized fellowship letter of recommendation. *Am J Med*. 2017;130(5):606-11.
4. Inclan PM, Cooperstein AA, Powers A, et al. When (almost) everyone is above average: a critical analysis of American Orthopaedic Association Committee of Residency Directors standardized letters of recommendation. *JBJS Open Access*. 2020;5(3):e20.00013-e20.00013.
5. Tavarez MM, Baghdassarian A, Bailey J, et al. A call to action for standardizing letters of recommendation. *J Grad Med Educ*. 2022;14(6):642-6.
6. Reghunathan M, Mehta I, Gosman AA. Improving the standardized letter of recommendation in the plastic surgery resident selection process. *J Surg Educ*. 2021;78(3):801-12.
7. Richard Alweis, Steven Angus, Michael Barone, et al. *The Coalition for Physician Accountability's Undergraduate Medical Education-Graduate Medical Education Review Committee (UGRC): Recommendations for Comprehensive Improvement of the UME-GME Transition*. Coalition for Physician Accountability; 2021:86.
8. Love JN, Deiorio NM, Ronan-Bentle S, et al. Characterization of the Council of Emergency Medicine Residency Directors' standardized letter of recommendation in 2011-2012. *Acad Emerg Med*. 2013;20(9):926-32.
9. Love JN, Smith J, Weizberg M, et al. Council of Emergency Medicine Residency Directors' standardized letter of recommendation: the program director's perspective. *Acad Emerg Med*. 2014;21(6):680-7.
10. Hegarty CB, Lane DR, Love JN, et al. Council of Emergency

Medicine Residency Directors standardized letter of recommendation writers' questionnaire. *J Grad Med Educ*. 2014;6(2):301-6.
11. Jackson JS, Bond M, Love JN, et al. Emergency Medicine Standardized Letter of Evaluation (SLOE): findings from the new electronic SLOE format. *J Grad Med Educ*. 2019;11(2):182-6.
12. Bord S, Dubosh N, Hegarty C, et al. SLOE: a step in the right direction. *AEM Educ Train*. 2023;7(3):e10881.
13. Schrepel C, Sehdev M, Dubosh NM, et al. Decoding competitiveness: exploring how emergency medicine faculty interpret standardized letters of evaluation. *AEM Educ Train*. 2024;8(4):e11019.
14. Jung J, Franzen D, Lawson L, et al. The National Clinical Assessment Tool for Medical Students in the Emergency Department (NCAT-EM). *West J Emerg Med*. 2018;19(1):66-74.
15. O'Dowd E, Lydon S, O'Connor P, et al. A systematic review of 7 years of research on entrustable professional activities in graduate medical education, 2011-2018. *Med Educ*. 2019;53(3):234-49.
16. Negaard M, Assimacopoulos E, Harland K, et al. Emergency medicine residency selection criteria: an update and comparison. *AEM Educ Train*. 2018;2(2):146-53.
17. Girzadas DV, Harwood RC, Dearie J, et al. A comparison of standardized and narrative letters of recommendation. *Acad Emerg Med Off J Soc Acad Emerg Med*. 1998;5(11):1101-4.
18. Sehdev M, Egan DJ, Bord S, et al. Prevalence and characteristics of group standardized letters of evaluation in emergency medicine: a cross-sectional observational study. *AEM Educ Train*. 2025;9(1):e11057.
19. Love JN, Doty CI, Smith JL, et al. The Emergency Medicine Group Standardized Letter of Evaluation as a workplace-based assessment: the validity is in the detail. *West J Emerg Med*. 2020;21(3):600-9.
20. Wright, K., Sapp, R., Commissaris, C., Monette, et al. Standard Letter of Evaluation Rating Associations with Individual versus Group Authorship and Volume of Letters Written. *West J Emerg Med.* 2025; 26: S2-3.
21. Beskind DL, Hiller KM, Stolz U, et al. Does the experience of the writer affect the evaluative components on the standardized letter of recommendation in emergency medicine? *J Emerg Med*. 2014;46(4):544-50.
22. Boysen-Osborn M, Andrusaitis J, Clark C, et al. A retrospective cohort study of the effect of home institution on emergency medicine standardized letters of evaluation. *AEM Educ Train*. 2019;3(4):340-6.
23. Pelletier-Bui A, Franzen D, Karl E, et al. Evaluating the impact of electronic interventions on EM Standardized Letter of Evaluation Part B Ratings. *West J Emerg Med.* 2025; 26: S65-6.
24. Shappell E, Hegarty C, Bord S, et al. Hawks and doves in standardized letters of evaluation: 6 years of rating distributions and trends in emergency medicine. *J Grad Med Educ*. 2024;16(3):328-32.
25. Hansroth JA, Davis KH, Quedado KD, et al. Lower-third SLOE rankings impede, but do not prevent, a match in emergency medicine residency training. *J Med Educ Curric Dev*. 2020;7:2382120520980487.
26. Pelletier-Bui A, Van Meter M, Pasirstein M, et al. Relationship between institutional standardized letter of evaluation global assessment ranking practices, interviewing practices, and medical student outcomes. *AEM Educ Train*. 2018;2(2):73-6.
27. Sehdev M, Schnapp B, Dubosh NM, et al. Measuring and predicting faculty consensus rankings of standardized letters of evaluation. *J Grad Med Educ*. 2024;16(1):51-8.
28. Schnapp B, Sehdev M, Schrepel C, et al. Faculty consensus on competitiveness for the new competency-based emergency medicine standardized letter of evaluation. *AEM Educ Train*. 2024;8(5):e11024.
29. Schnapp B, Sehdev M, Schrepel C, et al. ChatG - PD ? Comparing large language model artificial intelligence and faculty rankings of the competitiveness of standardized letters of evaluation. *AEM Educ Train*. 2024;8(6):e11052.
30. Hayden SR, Hayden M, Gamst A. What characteristics of applicants to emergency medicine residency programs predict future success as an emergency medicine resident? *Acad Emerg Med*. 2005;12(3):206-10.
31. Burkhardt JC, Parekh KP, Gallahue FE, et al. A critical disconnect: residency selection factors lack correlation with intern performance. *J Grad Med Educ*. 2020;12(6):696-704.
32. Bhat R, Takenaka K, Levine B, et al. Predictors of a top performer during emergency medicine residency. *J Emerg Med*. 2015;49(4):505-12.
33. Shappell E. Standardized letter of evaluation associations with ACGME Milestones. Accreditation Council for Graduate Medical Education Annual Educational Conference, Nashville, TN, February 2025. Oral presentation.
34. Miller DT, McCarthy DM, Fant AL, et al. The Standardized Letter of Evaluation narrative: differences in language use by gender. *West J Emerg Med*. 2019;20(6):948-56.
35. Kukulski P, Schwartz A, Hirshfield LE, et al. Racial bias on the Emergency Medicine Standardized Letter of Evaluation. *J Grad Med Educ*. 2022;14(5):542-8.
36. Mannix A, Monteiro S, Miller D, et al. Gender differences in emergency medicine standardized letters of evaluation. *AEM Educ Train*. 2022;6(2):e10740.
37. Grall KH, Hiller KM, Stoneking LR. Analysis of the evaluative components on the Standard Letter of Recommendation (SLOR) in emergency medicine. *West J Emerg Med*. 2014;15(4):419-23.
38. Wilson D, Laoteppitaks C, Chandra S. A comparison of standardized letters of evaluation for emergency medicine residency applicants. *West J Emerg Med*. 2020;22(1):20-5.
39. Kukulski P, Ahn J. Validity evidence for the Emergency Nedicine Standardized Letter of Evaluation. *J Grad Med Educ*. 2021;13(4):490-9.

Save The Date:



National Physician Suicide Awareness Day

September 17, 2026

For more information and resources:

www.cordem.org

CORD EM

www.cordem.org

CORD EM

JOB BOARD



DISCOVER YOUR
NEW CAREER

CORD EM



NEW WEBSITE

LAUNCHING SOON

Get ready for a new CORD website launching in 2026—designed to better connect you with the resources, people, and programs that move our community forward.

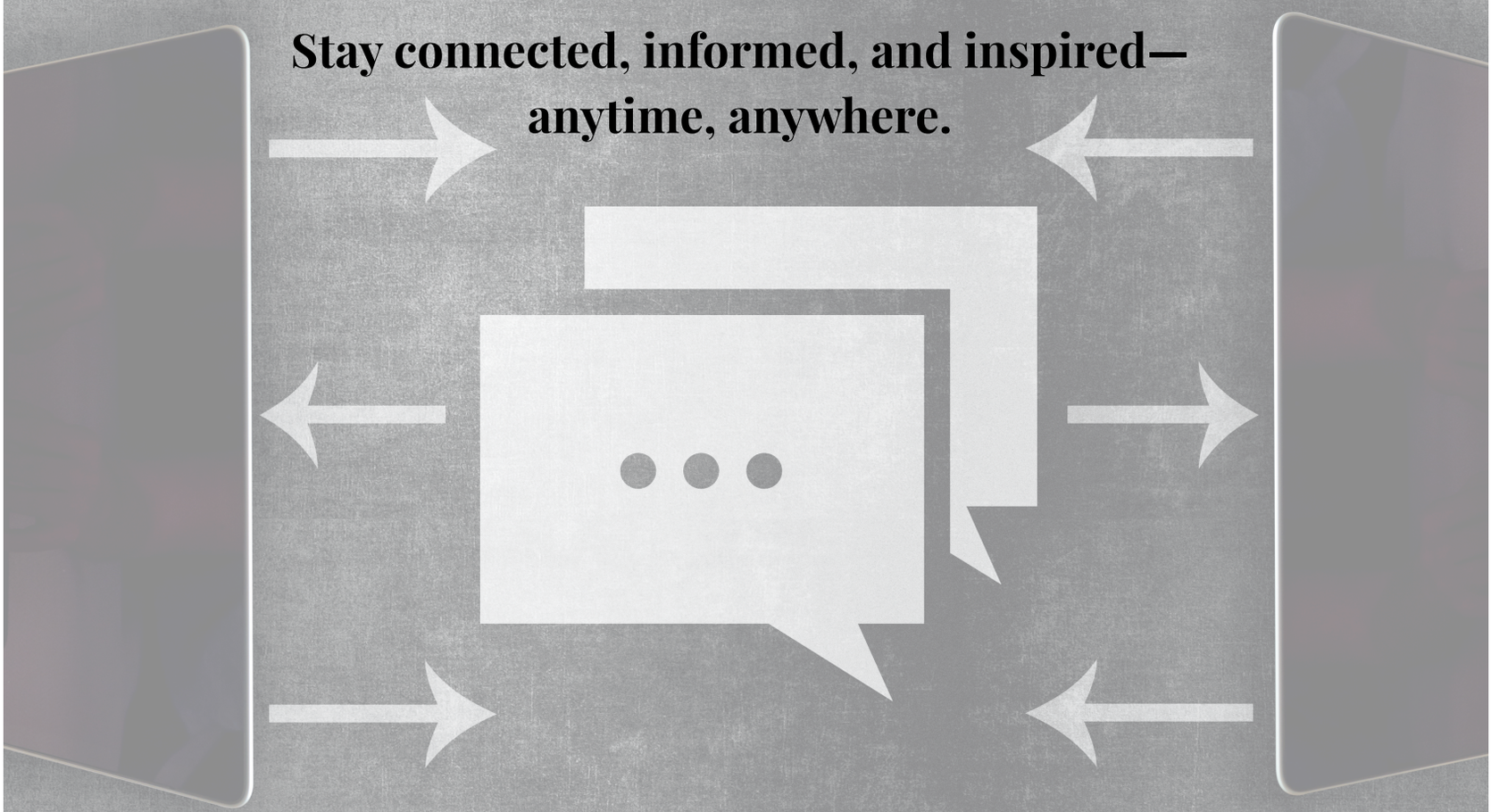
STAY TUNED

www.cordem.org

CORD EM

Connects

Stay connected, informed, and inspired—anytime, anywhere.



Browse and watch past sessions on demand:

www.cordem.org

CORD EM Cares



Help us make a difference in the lives of emergency medicine educators and trainees. Your donation supports wellness initiatives, crisis assistance, and more.

Donate Here:

www.cordem.org

www.cordem.org

SAVE THE DATE



ATLANTA

CORD Academic Assembly

April 17-21, 2027

#CORDAA27

JOIN CAL/AAEM!

CALAAEM
CALIFORNIA CHAPTER DIVISION OF THE AMERICAN ACADEMY OF EMERGENCY MEDICINE

Championing individual physician rights and workplace fairness

BENEFITS

- *Western Journal of Emergency Medicine* Subscription
- CAL/AAEM News Service email updates
- Free and discounted registration to CAL/AAEM events
- And more!

CAL/AAEM NEWS SERVICE

- Healthcare industry news
- Public policy
- Government issues
- Legal cases and court decisions

In collaboration with our official journal

WestJEM Integrating Emergency Care with Population Health

Join the CAL/AAEM Facebook Group to stay up-to-date:
www.facebook.com/groups/calaaem

www.aaem.org/calaaem

CALIFORNIA ACEP
AMERICAN COLLEGE OF EMERGENCY PHYSICIANS

MEDI-CAL RATE INCREASE

CALIFORNIA ACEP SECURED $200M ANNUALLY TO INCREASE MEDI-CAL REIMBURSEMENT FOR EMERGENCY PHYSICIANS!

EMERGENCY MEDICINE IS THE ONLY SPECIALTY WITH ITS OWN BUDGET ALLOCATION.



@CALIFORNIAACEP www.californiaacep.org