

PROF. INDI TREHAN (Orcid ID : 0000-0002-3364-6858)

DR. KAMNA SINGH BALHARA (Orcid ID : 0000-0001-6302-3355)

DR. TORBEN KIM BECKER (Orcid ID : 0000-0002-5287-8056)

Article type : Special Contribution

Global Emergency Medicine: A Review of the Literature from 2018

Running Title: Global Emergency Medicine Literature Review 2018

Indi Trehan, MD, MPH, DTM&H,^{1,*} Maxwell Osei-Ampofo, MBChB, MPH, MBA,² Kamna S. Balhara, MD, MA,³ Braden J. Hexom, MD,⁴ Sean M. Kivlehan, MD, MPH,⁵ Payal Modi, MD, MSc,⁶ Amelia Y. Pousson, MD, MPH,⁷ Anand Selvam, MD, MSc, DTM&H,⁸ Nana Serwaa A. Quao, MD,⁹ Daniel K. Cho,¹⁰ Torben K. Becker, MD, PhD,¹¹ and Adam C. Levine, MD, MPH,¹² on behalf of the Global Emergency Medicine Literature Review (GEMLR) Group¹³

¹Lao Friends Hospital for Children (IT), Luang Prabang, Lao PDR, and Department of Pediatrics, Washington University in St. Louis, Saint Louis, MO; indi@alum.berkeley.edu

²Emergency Medicine Directorate, Komfo Anokye Teaching Hospital and the Department of Anaesthesia and Intensive Care, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana; moampofo@gmail.com

³Department of Emergency Medicine, Johns Hopkins University, Baltimore, MD; kamna.balhara@gmail.com

⁴Department of Emergency Medicine, Rush University Medical Center, Chicago, IL; braden_hexom@rush.edu

⁵Department of Emergency Medicine, Brigham and Women's Hospital, Boston, MA, and Harvard Humanitarian Initiative, Cambridge, MA; smkivlehan@bwh.harvard.edu

⁶Department of Emergency Medicine, University of Massachusetts, Worcester, MA; payalmodimd@gmail.com

⁷Department of Emergency Medicine, Johns Hopkins University, Baltimore, MD; apousson@gmail.com

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/acem.13832

This article is protected by copyright. All rights reserved.

⁸Department of Emergency Medicine, Yale University, New Haven, CT; anand.selvam@yale.edu

⁹Department of Emergency Medicine, Korle Bu Teaching Hospital (NSAQ), Accra, Ghana; naysy25@gmail.com

¹⁰Brown University, Providence, RI; daniel_cho1@brown.edu

¹¹Department of Emergency Medicine, University of Florida, Gainesville, FL; tbeckermd@gmail.com

¹²Department of Emergency Medicine, Brown University (ACL), Providence, RI; adam_levine@brown.edu

¹³Global Emergency Medicine Literature Review (GEMLR) Group members are listed in Appendix A.

*Corresponding Author: Indi Trehan, MD, MPH, DTM&H

Author Contributions: study concept and design: IT, TKB, ACL; acquisition of data: DKC; analysis and interpretation of data: IT, MO-A, KSB, BJH, SMK, PM, AYP, AS, NSAQ, DKC; drafting of the manuscript: IT; critical revision of the manuscript for important intellectual content: IT, SMK, TKB, ACL; statistical expertise: IT; acquisition of funding: none.

No conflicts of interest for any authors.

ABSTRACT

The Global Emergency Medicine Literature Review (GEMLR) conducts a systematic annual search of peer-reviewed and gray literature relevant to global emergency medicine (EM) to identify, review, and disseminate the most rigorously conducted and widely relevant research in global EM. An electronic search of PubMed, a comprehensive retrieval of articles from specific journals, and search of the gray literature were conducted. Title and abstracts retrieved by these searches were screened by a total of 22 reviewers based on their relevance to the field of global EM, across the domains of Disaster and Humanitarian Response (DHR), Emergency Care in Resource-Limited Settings (ECRLS), and Emergency Medicine Development (EMD). All articles that were deemed relevant by at least one reviewer, their editor, and the managing editor underwent formal scoring of overall methodological quality and importance to global EM. Two independent reviewers scored all articles; editors provided a third score in cases of widely discrepant scores. A total of 19,102 articles were identified by the searches and, after screening and removal of duplicates, a total of 517 articles underwent full review. Twenty-five percent were categorized as DHR, 61% as ECRLS, and 15% as EMD. Inter-rater reliability testing between the reviewers revealed a Cohen's kappa score of 0.213 when considering the complete score, or 0.426 when excluding the more subjective half of the score. A total of 25 articles scored higher than 17.5 out of 20; these were selected for a full summary and critique. In 2018, the total number of articles relevant to global EM that were identified by our search continued to increase. Studies and reviews focusing on pediatric infections, several new and traditionally

under-represented topics, and landscape reviews that may help guide clinical care in new settings represented the majority of top-scoring articles. A shortage of articles related to the development of EM as a specialty was identified.

INTRODUCTION

The Global Emergency Medicine Literature Review (GEMLR) began in 2005 with a goal of improving the practice of emergency medicine (EM) worldwide by facilitating global EM practitioners' awareness of the most current and important research published in global settings. We work to identify and consolidate the relevant global EM literature into a format that is readily available to both academicians, practitioners, and public policy personnel. Each year, a panel of reviewers and editors is recruited to screen and critique literature identified from a systematic electronic and manual literature search. While the definition of global EM is open to interpretation, we consider it to be the practice and development of EM in settings without robust or mature EM systems commonly seen in resource-rich western countries.

GEMLR seeks to identify the most relevant practice-changing articles by systematically scouring both the peer-reviewed and gray literature via a comprehensive search strategy. Gray literature, representing material produced specifically to share research and clinical guidelines outside of the peer-reviewed literature, represents an important contribution to systematic reviews.¹ Given the amount of global EM research conducted by government agencies, non-governmental organizations, and other entities, manually searching for this information has the potential to identify important practice-changing findings.

Major goals of this review are to illustrate best practices, stimulate research, and promote further professionalization in the field of global EM through the identification of important new publications that focus on emergency care in the global context, especially disaster and humanitarian response, emergency care in resource-limited settings, and the development of EM as a clinical discipline worldwide.² The review has a structure and guidelines refined over more than a decade to bring reproducibility to the process, but we acknowledge there is an inherent subjectivity to any such endeavor. Nevertheless, this is a subjectivity we aim to minimize by using the collective experience of more than two dozen clinicians with vast knowledge and training in global EM who provide feedback on the literature with multiple layers of review and feedback.

Given the ever-increasing onslaught of medical literature and the ever-increasing contribution of emergency conditions to global morbidity and mortality worldwide,³ we aim to provide a highly curated annual resource⁴⁻¹⁶ – a starting point – for our colleagues worldwide to explore and understand important new developments in the field. This is not a formal systematic review or meta-analysis, as we do not aim to synthesize the literature around a specific topic or research question; GEMLR conducts a separate annual systematic review for that purpose.^{17,18}

METHODS

Full details of our procedures are available in **Data Supplement S1**. Significant changes from prior years' methodology included how articles with widely discrepant reviewer scores are handled, and how articles written by members of the editorial board are handled in terms of managing potential conflicts of interest. In the past, articles that were co-written by members of the editorial board were automatically excluded, but as this may have excluded some high-quality articles, our new conflict of interest policy allows for these articles to be included if three other senior members of the review independently agree that such articles were screened and scored appropriately without favorable bias given to the authors.

All participants in the review are unpaid volunteers selected based on their experience providing frontline emergency care and education around the world. This year's panel of 27 reviewers, 7 editors, and 5 editorial board members included physicians practicing in Australia, Canada, Egypt, Ethiopia, Ghana, Haiti, Laos, and the United States. The full list of participants is available in **Appendix A**.

Peer-Reviewed Literature Search

PubMed was searched in two blocks: the first block covered publications included in Medline from January 1 to August 31, 2018, and the second from September 1 to December 31, 2018. The search for original research and review articles that contained at least one "emergency medicine" search term plus one "global" search term (**Data Supplement S2**). Additionally, *all* articles published during 2018 in certain journals that have traditionally published a large number of global EM articles were retrieved to ensure that no relevant articles from these journals were missed by the Medline search. The journals included in this comprehensive retrieval process were *Academic Emergency Medicine*, *African Journal of Emergency Medicine*, *Annals of Emergency Medicine*, *Bulletin of the World Health Organization*, *Emergency Medicine Journal*, *The Lancet*, and *Prehospital and Disaster Medicine*.

Based on the linguistic abilities of our team this year, we restricted our searches to articles published in English, French, Portuguese, and Spanish. All studies were limited to human subjects only; news articles, editorials, case reports, commentaries, and letters to the editor were excluded.

Gray Literature Search

The web sites of a list of academic, think tank, government, United Nations, and nongovernmental organizations known to conduct significant global health research or implementation work (**Data Supplement S3**) were methodically searched by two reviewers. This year, the Emergency Nutrition Network and Partners In Health were added to this search. Specifically, needs assessments, program monitoring, evaluation reports, topic reviews, white papers, conference proceedings, and any other work that may be relevant to the field of global EM were sought.

Article Screening

The titles and abstracts of articles identified by these three search strategies were distributed among the reviewers for initial screening based on their relevance to the field of global EM. Those articles that were selected by the reviewers were further reviewed by an editor, and this year additionally by the assistant managing editor and managing editor for appropriateness. The articles that made it through this screening process were then selected for scoring.

Article Scoring

The full text of articles selected for scoring were obtained and classified as either Original Research (OR) or Review (RE) articles. Articles were also categorized as being most relevant to Disaster and Humanitarian Response (DHR), Emergency Care in Resource-Limited Settings (ECRLS), or Emergency Medicine Development (EMD). DHR articles include research on the care of civilian populations in conflict; disaster migration, assessment, and response; and the health care of refugees and internally displaced people. ECRLS articles focus on research to improve our understanding or management of acute conditions in resource-limited settings. EMD articles include research on the development of EM as a specialty, EM training programs, and emergency medical care systems in countries without advanced health care systems and fully developed EM systems.

Each full-text article was independently scored by two reviewers using a predefined grading scale that assessed each article's clarity, design, ethics, importance, and impact. Each of these topic areas was scored, totaling a final score range from 0 to 20 (**Data Supplement S4**). These criteria are designed to help identify methodologically sound and scientifically impactful research in the field of global EM.

The differences between the two scores for each article were then calculated and the median and standard deviation of these differences computed. Those articles whose scores differed by more than two standard deviations from the median were then rescored by an editor using the same 0-20 scale. The arithmetic mean of these three scores was then calculated and assigned as the final article score.

Full Article Review

Articles with scores in the top 5% of all scores were then selected for full formal review. These articles were then distributed to reviewers who wrote one-page summaries of these articles, including a summary of the key findings, and a critique of the results. These full reviews were then edited for style, content, consistency, and objectivity by an editor and the managing editor, as needed, prior to publication as part of this review.

RESULTS

A total of 15,893 articles were identified by the Medline search; an additional 3098 articles were identified by the comprehensive retrieval process of select journals and 19 articles were identified by the gray literature search. Among these, 25 were written in French, 16 in Portuguese, and 51 in Spanish. After screening and removal of duplicates, a total of 517 articles underwent full scoring (**Table 1; Data Supplement S5**).

Inter-rater reliability for reviewer scoring, measured using weighted Cohen's kappa^{19,20} was 0.213 (95% confidence interval, 0.160 to 0.267), generally considered "fair" reliability for such studies.²¹ Much of the variability in reviewer scores stemmed from the more subjective "Importance" and "Impact" scores (**Data Supplement S4**). When these two components of the overall scores were excluded, the weighted Cohen's kappa improved considerably to 0.426 (95% confidence interval, 0.372 to 0.479).

The threshold score that identified at most 5% of the top-scoring articles was identified as the cutoff for full reviews. For this year's review, the threshold was 17.5, which identified a total of 25 articles (4.8% of the 517 scored) for full review (**Table 2; Data Supplement S6**). Of these 25 articles, 4 (16%) were categorized as DHR and 21 (84%) as ECRLS; no articles from the gray literature search or in the EMD category achieved the threshold score for full review this year. Nine articles (36%) were original research articles and 16 (64%) were review articles. Full summaries and critical analyses of these top-scoring 25 global EM articles of 2018 identified by our search are available as **Data Supplement S7**.

DISCUSSION

The number of articles identified by our search as relevant to global EM increased by 7.3% compared to last year's search; however, the addition of a third screening step to verify the relevance of articles to global EM decreased the number of articles for formal scoring by 39%.

As has been the case with previous years' reviews, the articles that scored highest continued to be dominated by those classified as ECRLS. No EMD articles scored in the top 5% of all articles, which we believe reflects a shortage in the field and thus an opportunity for further research or descriptive studies about the advancement and implementation of emergency care around the world. Most of the highly scored articles this year were review articles, which may represent a maturation of the relevant literature to the degree that high-quality comprehensive syntheses and analyses of existing literature are being published.

A significant limitation of the study is the relatively low interobserver agreement between each set of two reviewers that scored the 517 articles selected for full review. A significant portion of this discrepancy arises from the more subjective "Importance" and "Impact" components of the scoring rubric (**Data Supplement S4**). This can be viewed as a disadvantage of the study methods and will warrant increased training for consistency and uniform comprehension and interpretation of the scoring rubric for future reviews. One might also consider these discrepancies to be an advantage, as this reflects the diversity of backgrounds and experiences of the GEMLR reviewers who trained and practice in such a wide variety of different settings around the world. The top-

scoring articles thus truly reflect a consensus among diverse reviewers and editors of what are indeed the most impactful global EM articles from the prior year.

Disaster and Humanitarian Response (DHR)

All four DHR articles identified as top-scoring were review articles. While not entirely unique to global EM, Boulton²² reviewed various types of prehospital hemostatic dressings for trauma and found little specific evidence to support one type of dressing over another but that there was the most experience and success with QuickClot combat gauze. Given the potentially long delay in transport for definitive trauma care in global settings, this finding has potentially important impact in global trauma settings where a selection of hemostatic dressings must be made; cost and availability would of course still have to be addressed.

The other three DHR articles that scored highly focused on what might be considered relatively new topics in global EM. Eckert²³ reviewed the role of social media in health emergencies – this has growing influence across all of our lives, but especially so in developing countries where access to other media may be limited, delayed, or censored. Although the data in this study was mostly from richer countries, no doubt social media will continue to gain influence globally and will be increasingly used in emergencies. Awareness of the benefits in informing the public and the potential harms of spreading misinformation is important to all practitioners of global EM.

An increasing trend in literature on mental health was exemplified by Mohammadinia²⁴ who attempted to understand what factors into resilience among children in natural disasters. They found a multitude of domains to consider but no perfect definition. Finally, Singh²⁵ reviewed 40 years of literature on sexual and reproductive health to highlight specific interventions that may be useful for future programming in this domain in humanitarian crises.

Emergency Care in Resource-Limited Settings (ECRLS)

This year's ECRLS articles were dominated by those most relevant to pediatric emergency medicine. Recognizing that accurate weight measurement is fundamental to pediatric care, Shrestha²⁶ showed that the novel PAWPER XL tape facilitated accurate rapid visual weight estimation in a population of Nepali children presenting for emergency care. This method has great potential for improved accuracy of dosing and selection of appropriately-sized equipment not only in populations where children are malnourished, but also in populations where a growing number of children are overweight/obese as well.

Four articles focused on pediatric pneumonia, which remains the leading cause of death among children worldwide. Sadruddin²⁷ demonstrated in a cluster-randomized pragmatic trial that a 3-day course of amoxicillin was superior to a 5-day course of co-trimoxazole for children with fast-breathing pneumonia treated in the community. This has significant potential for changing worldwide treatment patterns and additionally help decrease cost and increase compliance. Howie²⁸ conducted a multi-center, placebo-controlled, double-blind, randomized controlled trial (RCT) of zinc added to routine care for community-acquired pneumonia in The Gambia. Although there was no

Accepted Article

decrease in failure rates, this may have been due to a relatively low rate of baseline zinc deficiency, which should motivate a similar study in a population where zinc deficiency is a more pervasive problem. Nayani²⁹ validated the Clinical Respiratory Score in children presenting to a single ED in Pakistan for determining its predictive value for admission to a critical care unit of the hospital. A simple and affordable scoring system such as this one has great potential for helping with triage and appropriate resource utilization. A review by Balk³⁰ found higher sensitivity using ultrasound compared to X-ray for diagnosing pediatric community-acquired pneumonia, which may help increase rates of pneumonia diagnosis and appropriate treatment worldwide. This is an excellent example of an affordable technology that can be used to democratize and improve care in resource-limited settings.

Another effective use of novel technology was demonstrated by Bilal³¹ who tested the use of a novel mobile phone application for diagnosing dehydration in children and adults in Bangladesh. The technology was a significant improvement in assessing the degree of dehydration, particularly in adults and older children. Several other important articles studying pediatric gastroenteritis, the second largest cause of pediatric mortality, were also identified.

In terms of treatment, Freedman³² conducted a rigorous, placebo-controlled, RCT in Pakistan demonstrating that ondansetron was of little benefit to non-dehydrated children with gastroenteritis in the emergency setting. Given the cost of this medication and the assumption that it would be widely useful across many populations, this is important, widely generalizable, evidence that can help limit the use of a potentially expensive medication that may not provide significant clinical benefit in this setting. Pérez-Gaxiola³³ conducted a rigorous Cochrane Review of the added benefit of smectite, a clay mineral that may adsorb toxin, to the treatment regimen for children with diarrhea. The review was limited by low quality evidence and trials at high risk of bias but there was the implication of enough equipoise to justify a rigorously conducted trial with clearer enrollment, methods, and outcome measures. With regards to a specific infection, Williams³⁴ reviewed recent microbiological and clinical literature to identify the optimal antimicrobial treatment regimen for pediatric cholera infection. After a thorough review that leaned heavily on data from adult patients and with significant consideration to rising rates of antimicrobial resistance, the authors conclude that single-dose azithromycin is the best antibiotic regimen for children with cholera that balances effectiveness with practical delivery.

Iro³⁵ attempted to identify RCTs that would provide evidence for or against the WHO recommendation for rapid IV fluid resuscitation for children with severe dehydration due to acute gastroenteritis. There were no trials identified in resource-poor settings and only three trials identified overall, none of which produced evidence to support the current WHO recommendation, once again demonstrating that clinical evidence from resource-rich settings may not necessarily apply directly to resource-limited settings in all cases.

Kailemia³⁶ conducted a creative RCT wherein children's caregivers documented oral rehydration solution intake and symptoms during the course of treatment for diarrhea and dehydration. This task-shifting activity proved effective in reducing the rates of dehydration and hospitalization. This may be generalizable to other settings and leveraged to help improve patient care and efficiency for other illnesses also.

Two reviews related to pediatric sepsis were also selected for full review. Fleischmann-Struzek³⁷ conducted a systematic review and meta-analysis to attempt to define the burden of pediatric and neonatal sepsis worldwide. However, significant limitations in the availability of literature and data from low-income settings greatly limited the review's generalizability and provides what is really a lower estimate for pediatric sepsis. Fuchs³⁸ conducted a thorough systematic review of appropriate antibiotics for pediatric sepsis in LMICs and found no specific evidence to warrant a change in WHO guidelines or common clinical practice.

With regards to adult patients, Morton³⁹ conducted the first review of bundled interventions against sepsis among adults in sub-Saharan Africa and found that this protocolized care actually results in *higher* mortality, emphasizing the importance of local data used to generate local protocols rather than universally applied bundles. Nepal⁴⁰ reviewed tenecteplase as a thrombolytic agent for acute ischemic stroke. When compared to the more widely-used alteplase, they found it to be a justifiable alternative in resource-limited settings, given its safety and efficacy profiles as well as lower cost. Nainggolan⁴¹ conducted a pilot study comparing oral isotonic solution to water for hydration in adults with dengue. Although this very small trial did not demonstrate any statistically significant benefits from the oral isotonic solution, there were small trends towards secondary benefits that are worth exploring in a larger trial.

Another RCT for an important global EM topic was conducted by Chowdhury⁴² who studied the effect of salbutamol (albuterol) on organophosphate poisoning. This pilot study proved to be too small and limited to demonstrate any difference in efficacy between placebo, 2.5mg of salbutamol, and 5mg of salbutamol. This doesn't exclude the possibility that salbutamol would be effective in this setting, but this was not proven in this case. E Silva⁴³ conducted a comprehensive review of the use of intravenous lidocaine for pain management of several common acute conditions with the intention of providing an alternative to opiates. This is a potentially powerful alternative intervention in a time of the global opiate crisis, but also important in places around the world where opiates may not be available. Unfortunately, no clear evidence was found to show its safety and usefulness in the ED setting yet.

Finally, three "big picture" landscape reviews scored highly and were evaluated in full. Broccoli^{44,45} summarized the process by which an Essential Medicines List (EML) for emergency care providers in Africa was created through a series of consensus meetings. This list has tremendous importance for planners who may want to start EDs and plan for emergency care in places where this development has been relatively decentralized and variable from setting to setting. Dahn⁴⁶ undertook a comprehensive landscape review of acute clinical care for emergency conditions that contribute most to morbidity and mortality in LMICs. This review provides a good starting point for practitioners entering the field and also highlights the need for more contextual local data, as the review was mostly only able to identify data from Asian settings. Vecino-Ortiz⁴⁷ conducted a comprehensive review of interventions to prevent unintentional injuries in LMICs and estimate how many lives might be saved if all of these interventions were able to be implemented throughout countries where the world's poorest billion live.

CONCLUSIONS

The 2018 Global Emergency Medicine Literature Review again identified several hundred articles related to global EM. The highest scoring articles were all in DHR and ECRLS. New technologies and traditionally less studied topics were well-represented, including social media, mental health, sexual and reproductive health, and pain management. This year's top-scoring articles were dominated by pediatric infectious emergencies, including pneumonia, gastroenteritis, and sepsis. Several high-quality reviews that help define fundamental issues in the field were also identified that may provide concrete guidance as global EM develops standardized care models. Overall, the clinical research literature in global EM is robust and growing despite many barriers,⁴⁸ although large room for growth remains for data emanating from resource-limited settings.

Appendix A. Members of the 2018 Global Emergency Medicine Literature Review.

Global Emergency Medicine Literature Review (GEMLR) Group (in alphabetical order) members:

Holly Bannon-Murphy, MBBS, Emergency and Trauma Centre, Alfred Health, Melbourne, Australia

Susan A. Bartels, MD, MPH, FRCPC, Department of Emergency Medicine and Department of Public Health Sciences, Queen's University, Kingston, Canada

Temesgen Beyene, MD, Department of Emergency Medicine, Addis Ababa University, Addis Ababa, Ethiopia

Joseph Bonney, MBChB, MPH, Emergency Medicine, Komfo Anokye Teaching Hospital, Kumasi, Ghana

Amanda T. Collier, MD, DTM&H, Department of Emergency Medicine, Queen's University, Kingston, Canada

Jolene Cook, MD, Department of Emergency Medicine, Dalhousie University, Halifax, Canada, Hôpital Universitaire de Mirebalais, Mirebalais, Haiti, and Emergency Health Services, Government of Nova Scotia, Halifax, Canada

Jonathan W. Dyal, MD, MPH, Department of Emergency Medicine, Brigham and Women's Hospital, Boston, MA

Kayla T. Enriquez, MD, MPH, Department of Emergency Medicine, University of California, San Francisco, San Francisco, CA

Danica J. Gomes, MD, MSc, Centers for Disease Control and Prevention, Atlanta, GA

Alison S. Hayward, MD, MPH, Department of Emergency Medicine, Brown University, Providence, RI

Wesam M. A. Ibrahim, MBCh, MSc, Department of Emergency Medicine and Traumatology, Tanta University, Tanta, Egypt

Devin M. Keefe, MD, Department of Emergency Medicine, Portsmouth Regional Hospital, Portsmouth, NH

J. Austin Lee, MD, MPH, Department of Emergency Medicine, University of Virginia, Charlottesville, VA

Sangil Lee, MD, MS, Department of Emergency Medicine, University of Iowa, Iowa City, IA

Richard Lowsby MBChB, FRCER, DTMH, Emergency Department, Mid Cheshire Hospitals NHS Foundation Trust, UK

Rishi P. Mediratta, MD, MSc, MA, Department of Pediatrics, Stanford University, Stanford, CA

Carl T. Mickman, MD, Department of Emergency Medicine, Mount Sinai Hospital, New York, NY

Benjamin D. Nicholson, MD, Department of Emergency Medicine, Boston Medical Center, Boston, MA

Gerard M. O'Reilly, MBBS, FACEM, MPH, MBIostat, PhD, Emergency and Trauma Centre, The Alfred, Melbourne, Australia, and School of Public Health and Preventive Medicine, Monash University, Melbourne, Australia

Pryanka Relan, MD, MPH, Emergency Medicine, Emory Healthcare Network, Atlanta, GA

Kyle T. Ragins, MD, MBA, Department of Emergency Medicine, University of California, Los Angeles, Los Angeles, CA

Eleanor A. Reid, MD, MSc, DTM&H, Department of Emergency Medicine, Yale University, New Haven, CT

Charlotte M. Roy, MD, Section of Emergency Medicine, University of Chicago, Chicago, IL

Megan M. Rybarczyk, MD, MPH, Department of Emergency Medicine, Brigham and Women's Hospital, Boston, MA

Megan L. Schultz, MD, MA, Department of Pediatrics, Medical College of Wisconsin, Milwaukee, WI

Kimberly A. Stanford, MD, Section of Emergency Medicine, University of Chicago, Chicago, IL

Lara D. Vogel, MD, MBA, Harvard Affiliated Emergency Medicine Residency Program, Boston, MA

Alex H. Wang, MD, Department of Emergency Medicine, University of Connecticut, Hartford, CT

Ayalew Zewdie, MD, Department of Emergency Medicine and Critical Care, St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia

SUPPORTING INFORMATION

The following supporting information is available in the online version of this paper:

Data Supplement S1. GEMLR 2018 Procedure Manual.

Data Supplement S2. Medline search terms.

Data Supplement S3. Gray literature sources.

Data Supplement S4. GEMLR scoring criteria.

Data Supplement S5. Complete database of all 517 identified global EM articles for 2018.

Data Supplement S6. Flow diagram of articles selected for review.

Data Supplement S7. Full summaries and critical analyses of the top-scoring GEMLR articles of 2018.

REFERENCES

1. Paez A. Gray literature: An important resource in systematic reviews. *J Evid Based Med* 2017;10:233-240.
2. Hansoti B, Aluisio AR, Barry MA, et al. Global health and emergency care: Defining clinical research priorities. *Acad Emerg Med* 2017;24:742-753.
3. Razzak J, Usmani MF, Bhutta ZA. Global, regional and national burden of emergency medical diseases using specific emergency disease indicators: Analysis of the 2015 global burden of disease study. *BMJ Glob Health* 2019;4:e000733.
4. Levine AC, Gadiraju S, Goel A, et al. International emergency medicine: A review of the literature. *Acad Emerg Med* 2007;14:182-183.
5. Levine AC, Goel A, Keay CR, et al. International emergency medicine: A review of the literature from 2006. *Acad Emerg Med* 2007;14:1190-1193.
6. Levine AC, Becker J, Lippert S, et al. International emergency medicine: A review of the literature from 2007. *Acad Emerg Med* 2008;15:860-865.
7. Lippert S, Levine AC, Becker J, et al. International emergency medicine: A review of the literature from 2008. *Acad Emerg Med* 2009;16:1335-1340.
8. Aschkenasy M, Arnold K, Foran M, et al. International emergency medicine: A review of the literature from 2010. *Acad Emerg Med* 2011;18:872-879.
9. Foran M, Levine A, Lippert S, et al. International emergency medicine: A review of the literature from 2009. *Acad Emerg Med* 2011;18:86-92.
10. Schroeder ED, Jacquet G, Becker TK, et al. Global emergency medicine: A review of the literature from 2011. *Acad Emerg Med* 2012;19:1196-1203.
11. Jacquet GA, Foran M, Bartels S, et al. Global emergency medicine: A review of the literature from 2012. *Acad Emerg Med* 2013;20:835-843.
12. Becker TK, Jacquet GA, Marsh R, et al. Global emergency medicine: A review of the literature from 2013. *Acad Emerg Med* 2014;21:810-817.
13. Becker TK, Bartels S, Hansoti B, et al. Global emergency medicine: A review of the literature from 2014. *Acad Emerg Med* 2015;22:976-984.
14. Becker TK, Hansoti B, Bartels S, et al. Global emergency medicine: A review of the literature from 2015. *Acad Emerg Med* 2016;23:1183-1191.
15. Becker TK, Hansoti B, Bartels S, et al. Global emergency medicine: A review of the literature from 2016. *Acad Emerg Med* 2017;24:1150-1160.
16. Becker TK, Trehan I, Hayward AS, et al. Global emergency medicine: A review of the literature from 2017. *Acad Emerg Med* 2018;25:1287-1298.
17. Balhara KS, Silvestri DM, Tyler Winders W, et al. Impact of nutrition interventions on pediatric mortality and nutrition outcomes in humanitarian emergencies: A systematic review. *Trop Med Int Health* 2017;22:1464-1492.
18. Balhara KS, Bustamante ND, Selvam A, et al. Bystander assistance for trauma victims in low- and middle-income countries: A systematic review of prevalence and training interventions. *Prehosp Emerg Care* 2019;23:389-410.
19. Cohen J. Weighted kappa: Nominal scale agreement with provision for scaled disagreement or partial credit. *Psychol Bull* 1968;70:213-220.
20. Maclure M, Willett WC. Misinterpretation and misuse of the kappa statistic. *Am J Epidemiol* 1987;126:161-169.
21. Kundel HL, Polansky M. Measurement of observer agreement. *Radiology* 2003;228:303-308.
22. Boulton AJ, Lewis CT, Naumann DN, Midwinter MJ. Prehospital haemostatic dressings for trauma: A systematic review. *Emerg Med J* 2018;35:449-457.
23. Eckert S, Sopory P, Day A, et al. Health-related disaster communication and social media: Mixed-method systematic review. *Health Commun* 2018;33:1389-1400.
24. Mohammadinia L, Ardalan A, Khorasani-Zavareh D, et al. Domains and indicators of resilient children in natural disasters: A systematic literature review. *Int J Prev Med* 2018;9:54.

- Accepted Article
25. Singh NS, Smith J, Aryasinghe S, et al. Evaluating the effectiveness of sexual and reproductive health services during humanitarian crises: A systematic review. *PLoS One* 2018;13:e0199300.
 26. Shrestha K, Subedi P, Pandey O, et al. Estimating the weight of children in nepal by broselow, pawper xl and mercy method. *World J Emerg Med* 2018;9:276-281.
 27. Sadruddin S, Khan IUH, Fox MP, et al. Comparison of 3 days amoxicillin versus 5 days co-trimoxazole for treatment of fast-breathing pneumonia by community health workers in children aged 2-59 months in Pakistan: A cluster-randomized trial. *Clin Infect Dis* 2018.
 28. Howie S, Bottomley C, Chimah O, et al. Zinc as an adjunct therapy in the management of severe pneumonia among Gambian children: Randomized controlled trial. *J Glob Health* 2018;8:010418.
 29. Nayani K, Naeem R, Munir O, et al. The clinical respiratory score predicts paediatric critical care disposition in children with respiratory distress presenting to the emergency department. *BMC Pediatr* 2018;18:339.
 30. Balk DS, Lee C, Schafer J, et al. Lung ultrasound compared to chest x-ray for diagnosis of pediatric pneumonia: A meta-analysis. *Pediatr Pulmonol* 2018;53:1130-1139.
 31. Bilal S, Nelson E, Meisner L, et al. Evaluation of standard and mobile health-supported clinical diagnostic tools for assessing dehydration in patients with diarrhea in rural Bangladesh. *Am J Trop Med Hyg* 2018;99:171-179.
 32. Freedman SB, Soofi SB, Willan AR, et al. Oral ondansetron administration to nondehydrated children with diarrhea and associated vomiting in emergency departments in Pakistan: A randomized controlled trial. *Ann Emerg Med* 2019;73:255-265.
 33. Perez-Gaxiola G, Cuello-Garcia CA, Florez ID, Perez-Pico VM. Smectite for acute infectious diarrhoea in children. *Cochrane Database Syst Rev* 2018;4:CD011526.
 34. Williams PCM, Berkley JA. Guidelines for the management of paediatric cholera infection: A systematic review of the evidence. *Paediatr Int Child Health* 2018;38:S16-S31.
 35. Iro MA, Sell T, Brown N, Maitland K. Rapid intravenous rehydration of children with acute gastroenteritis and dehydration: A systematic review and meta-analysis. *BMC Pediatr* 2018;18:44.
 36. Kailemia M, Kariuki N, Laving A, Agweyu A, Wamalwa D. Caregiver oral rehydration solution fluid monitoring charts versus standard care for the management of some dehydration among Kenyan children: A randomized controlled trial. *Int Health* 2018;10:442-450.
 37. Fleischmann-Struzek C, Goldfarb DM, Schlattmann P, et al. The global burden of paediatric and neonatal sepsis: A systematic review. *Lancet Respir Med* 2018;6:223-230.
 38. Fuchs A, Bielicki J, Mathur S, Sharland M, Van Den Anker JN. Reviewing the WHO guidelines for antibiotic use for sepsis in neonates and children. *Paediatr Int Child Health* 2018;38:S3-S15.
 39. Morton B, Stolbrink M, Kagima W, Rylance J, Mortimer K. The early recognition and management of sepsis in sub-Saharan African adults: A systematic review and meta-analysis. *Int J Environ Res Public Health* 2018;15.
 40. Nepal G, Kharel G, Ahamad ST, Basnet B. Tenecteplase versus alteplase for the management of acute ischemic stroke in a low-income country-nepal: Cost, efficacy, and safety. *Cureus* 2018;10:e2178.
 41. Nainggolan L, Bardosono S, Ibrahim Ilyas EI. The tolerability and efficacy of oral isotonic solution versus plain water in dengue patients: A randomized clinical trial. *Indian J Community Med* 2018;43:29-33.
 42. Chowdhury FR, Rahman MM, Ullah P, et al. Salbutamol in acute organophosphorus insecticide poisoning - a pilotdose-response phase ii study. *Clin Toxicol (Phila)* 2018;56:820-827.
 43. e Silva LOJ, Scherber K, Cabrera D, et al. Safety and efficacy of intravenous lidocaine for pain management in the emergency department: A systematic review. *Ann Emerg Med* 2018;72:135-144.
 44. Broccoli MC, Pigoga JL, Nyirenda M, Wallis L, Calvello Hynes EJ. Essential medicines for emergency care in Africa. *Emerg Med J* 2018;35:412-419.

- Accepted Article
45. Broccoli MC, Pigoga JL, Nyirenda M, Wallis LA, Calvillo Hynes EJ. Essential medicines for emergency care in Africa. *Afr J Emerg Med* 2018;8:110-117.
 46. Dahn CM, Wijesekera O, Garcia GE, Karasek K, Jacquet GA. Acute care for the three leading causes of mortality in lower-middle-income countries: A systematic review. *Int J Crit Illn Inj Sci* 2018;8:117-142.
 47. Vecino-Ortiz AI, Jafri A, Hyder AA. Effective interventions for unintentional injuries: A systematic review and mortality impact assessment among the poorest billion. *Lancet Glob Health* 2018;6:e523-e534.
 48. Levine AC, Barry MA, Agrawal P, et al. Global health and emergency care: Overcoming clinical research barriers. *Acad Emerg Med* 2017;24:484-493.

Table 1. Summary Statistics for Article Scoring

	Number (%)	Scores				
		Minimum	25 th Percentile	Median	75 th Percentile	Maximum
TOTAL	517 (100)	5	12	14	15.5	20
Article Category						
Disaster and Humanitarian Response (DHR)	129 (25.0)	5	11.5	13.5	15	18.5
Emergency Care in Resource-Limited Settings (ECRLS)	313 (60.5)	5.67	12.5	14	15.75	20
Emergency Medicine Development (EMD)	75 (14.5)	5	11.5	13	14.5	17
Type of Research Article						
Original Research (OR) Article	400 (77.4)	5	12	14	15.25	19.5
Review (RE) Article	117 (22.6)	6	12	14.5	16.5	20

Table 2. Global Emergency Medicine Literature Review 2018 Articles

Category	First Author	Title	Journal	OR or RE	Summary
Disaster and Humanitarian Response (DHR)	Boulton AJ ²²	Prehospital haemostatic dressings for trauma: A systematic review	Emerg Med J	RE	Hemostatic dressings in the prehospital environment are effective, but this systematic review was unable to identify a superior type.
	Eckert S ²³	Health-related disaster communication and social media: Mixed-method systematic review	Health Commun	RE	This review applies rigorous methodology to analyze the existing quantitative and qualitative literature regarding the use of social media in health disasters.
	Mohammadinia L ²⁴	Domains and indicators of resilient children in natural disasters: A systematic literature review	Int J Prev Med	RE	This meta-analysis and qualitative evaluation of literature regarding children in natural disasters investigates the various methods used to assess “resiliency” and summarizes the categories in a framework.
	Singh NS ²⁵	Evaluating the effectiveness of sexual and reproductive health services during humanitarian crises: A systematic review	PLoS ONE	RE	This broad review of forty years of literature on sexual and reproductive health in humanitarian crises highlights evidence-based interventions useful for designing future programs.
Emergency Care in Resource-Limited Settings (ECRLS)	Balk DS ³⁰	Lung ultrasound compared to chest X-ray for diagnosis of pediatric pneumonia: A meta-analysis	Pediatr Pulmonol	RE	Although chest X-ray is the standard imaging modality for diagnosing pediatric community-acquired pneumonia, it has many limitations and is often inaccessible in resource-limited settings. The review demonstrates that lung ultrasound may be a feasible alternative that is more sensitive than chest x-ray in the diagnosis of pediatric pneumonia.

Category	First Author	Title	Journal	OR or RE	Summary
	Bilal S ³¹	Evaluation of standard and mobile health-supported clinical diagnostic tools for assessing dehydration in patients with diarrhea in rural Bangladesh	Am J Trop Med Hyg	OR	Utilizing a mobile health-supported tool, nurses assessed dehydration status of both pediatric and adult patients with diarrheal illness in a rural hospital. This study reported superior inter-observer agreement with the mobile tool than standard evaluation methods.
	Broccoli MC ^{44,45}	Essential medicines for emergency care in Africa	Emerg Med J; Afr J Emerg Med	RE	This review proposes an Essential Medicines List (EML) specifically for emergency care in resource-constrained settings. Through structured literature review and expert consensus, the authors present an EML for emergency care in Africa comprised of 213 medicines, 25 of which are new to the emergency-focused EML.
	Chowdhury FR ⁴²	Salbutamol in acute organophosphorus insecticide poisoning - a pilot dose-response phase II study	Clin Toxicol (Phila)	OR	This pilot, proof-of-concept, dose-response randomized controlled trial reports no significant difference in resuscitation parameters and outcomes when adding nebulized salbutamol to the standard treatment of acute self-inflicted organophosphate poisoning in a tertiary care center in Bangladesh.
	Dahn CM ⁴⁶	Acute care for the three leading causes of mortality in lower-middle-income countries: A systematic review	Int J Crit Illn Inj Sci	RE	Diagnostic and therapeutic interventions for acute presentations related to the three leading causes of mortality in lower-middle-income countries (ischemic heart disease, stroke, and lower respiratory infections) are available and effective, but data is lacking outside of Asia.

Category	First Author	Title	Journal	OR or RE	Summary
	e Silva LOJ ⁴³	Safety and efficacy of intravenous lidocaine for pain management in the emergency department: A systematic review	Ann Emerg Med	RE	Intravenous lidocaine has been used effectively as an analgesic in well-controlled outpatient and inpatient settings; however, its efficacy and safety in the Emergency Department (ED) has not been established. This review shows that more study is needed before it can be recommended for an ED population.
	Fleischmann-Struzek C ³⁷	The global burden of paediatric and neonatal sepsis: A systematic review	Lancet Respir Med	RE	This systematic review and meta-analysis estimated the population-based incidence of sepsis among neonates and children globally, but was only able to use data from high-income settings, thereby limiting generalizability.
	Freedman SB ³²	Oral ondansetron administration to nondehydrated children with diarrhea and associated vomiting in emergency departments in Pakistan: A randomized controlled trial	Ann Emerg Med	OR	Non-dehydrated children in Pakistan with vomiting as a result of acute gastroenteritis do not benefit from a single oral dose of ondansetron. Ondansetron in these children did not decrease the use of intravenous fluids.
	Fuchs A ³⁸	Reviewing the WHO guidelines for antibiotic use for sepsis in neonates and children	Paediatr Int Child Health	RE	A systematic review of recent literature and guidelines regarding antibiotic treatment regimens for bacterial sepsis in neonates and young children in low and middle income communities recommends no change in practice.
	Howie S ²⁸	Zinc as an adjunct therapy in the management of severe pneumonia among Gambian	J Glob Health	OR	Providing zinc supplementation to children in Gambia who were being treated for severe pneumonia did not have an impact on treatment

Category	First Author	Title	Journal	OR or RE	Summary
		children: Randomized controlled trial			failure rates.
	Iro MA ³⁵	Rapid intravenous rehydration of children with acute gastroenteritis and dehydration: A systematic review and meta-analysis	BMC Pediatr	RE	There is very limited evidence, including a paucity of high-quality studies in low-income settings, in support of the WHO guideline for rapid intravenous rehydration in children with severe dehydration due to acute gastroenteritis.
	Kailemia M ³⁶	Caregiver oral rehydration solution fluid monitoring charts versus standard care for the management of some dehydration among Kenyan children: A randomized controlled trial	Int Health	OR	When children's caregivers use a chart to monitor the administration of oral rehydration solution, there is a reduction in the amount of dehydration in children with diarrhea.
	Morton B ³⁹	The early recognition and management of sepsis in sub-Saharan African adults: A systematic review and meta-analysis	Int J Environ Res Public Health	RE	The first review of early sepsis interventions in adults in sub-Saharan Africa found that protocolized care may be associated with higher mortality, although this conclusion is based on only two of three high-quality studies from the region.
	Nainggolan L ⁴¹	The tolerability and efficacy of oral isotonic solution versus plain water in dengue patients: A randomized clinical trial	Indian J Community Med	OR	This small single-blind randomized controlled trial comparing oral isotonic solution to oral plain water for the treatment of dengue found no statistically significant differences in efficacy or tolerability of the two solutions.
	Nayani K ²⁹	The clinical respiratory score predicts paediatric critical care	BMC Pediatr	OR	The Clinical Respiratory Score (CRS) is a triage tool previously studied only in high-income settings

Category	First Author	Title	Journal	OR or RE	Summary
		disposition in children with respiratory distress presenting to the emergency department			related to specific respiratory diseases. In this study, the authors validated its expanded use through a prospective observational study of pediatric patients who presented to the emergency department (ED) with a variety of diagnoses in a single center tertiary care ED in Pakistan.
	Nepal G ⁴⁰	Tenecteplase versus alteplase for the management of acute ischemic stroke in a low-income country-Nepal: Cost, efficacy, and safety	Cureus	RE	The current evidence for efficacy and safety of IV tenecteplase in comparison to IV alteplase as thrombolytic therapy for acute ischemic stroke (AIS) is reviewed. Tenecteplase is a reasonable alternative to alteplase, especially in low-income settings.
	Pérez-Gaxiola G ³³	Smectite for acute infectious diarrhoea in children	Cochrane Database Syst Rev	RE	Smectite may reduce duration of diarrhea by 24 hours and increase clinical resolution by day 3 after treatment but conclusions are based on low quality evidence and trials at high risk of bias.
	Sadrudin S ²⁷	Comparison of 3 days amoxicillin versus 5 days co-trimoxazole for treatment of fast-breathing pneumonia by community health workers in children aged 2-59 months in Pakistan: A cluster-randomized trial	Clin Infect Dis	OR	A 3-day course of amoxicillin reduced treatment failure and improved compliance when compared to a 5-day course of co-trimoxazole in children younger than 5 years of age with fast-breathing pneumonia.
	Shrestha K ²⁶	Estimating the weight of children in Nepal by Broselow,	World J Emerg Med	OR	The PAWPER XL tape allows more accurate weight estimation of children presenting for medical care in Nepal compared to the Broselow tape and Mercy

Category	First Author	Title	Journal	OR or RE	Summary
		PAWPER XL and Mercy method			method.
	Vecino-Ortiz AI ⁴⁷	Effective interventions for unintentional injuries: A systematic review and mortality impact assessment among the poorest billion	Lancet Glob Health	RE	This systematic review summarizes injury reduction interventions that have effectively reduced mortality, as well as the number of lives that could be saved annually by these interventions if they were implemented for the world's poorest billion people.
	Williams PCM ³⁴	Guidelines for the management of paediatric cholera infection: A systematic review of the evidence	Paediatr Int Child Health	RE	After a thorough systematic review, the authors recommend a change in practice by proposing that a single dose of azithromycin be recommended as first-line treatment of cholera in children.

OR = Original Research Article; RE = Review Article