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SPECIAL CONTRIBUTION

Global Emergency Medicine: A Review of the Literature From 2011

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Abstract

Objectives: The Global Emergency Medicine Literature Review (GEMLR) conducts an annual search of published and unpublished articles relevant to global emergency medicine (EM) to identify, review, and disseminate the most important research in this field to a wide audience of academics and practitioners.

Methods: This year, 7,924 articles written in seven languages were identified by our search. These articles were divided up among 20 reviewers for initial screening based on their relevance to the field of global EM. An additional two reviewers searched the grey literature. A total of 206 articles were deemed appropriate by at least one reviewer and approved by their editor for formal scoring of their overall quality and importance.

Results: Of the 206 articles that met our predetermined inclusion criteria, 24 articles received scores of 17 or higher and were selected for formal summary and critique. Interrater reliability for our scoring system was good with an interclass correlation coefficient of 0.628 (95% confidence interval = 0.51 to 0.72).

Conclusions: Compared to previous reviews, there was a significant increase in the number of articles that were devoted to emergency care in resource-limited settings, with fewer articles related to disaster and humanitarian response. The majority of articles that met our selection criteria were reviews that examined the efficacy of particular treatment regimens for diseases that are primarily seen in low- and middle-income countries.

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International events dominated the news media for much of 2011. The year started with Pakistan struggling to rebuild after widespread flooding submerged a large part of the country in late 2010. By the end of January, the Arab Spring had commenced with major protests taking place in Tunisia and Egypt. Libya, Syria, and Bahrain were quick to follow and continue to struggle. In many cases, health care systems were uprooted with the changes in government. In March, a massive earthquake hit Japan, followed by a tsunami and nuclear meltdown. We are just beginning to understand the health effects of these events and will likely be study-

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Global Emergency Medicine Literature Review (GEMLR) Group members are listed in Appendix A.
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ing them for years to come. Perhaps in part due to the international media focus of the past year, global health continued to gain respect and interest within emergency medicine (EM). In May 2011, members of the Society of Academic Emergency Medicine formed the Global Emergency Medicine Academy to improve the global delivery of emergency care through research, education, and mentorship.

The Global Emergency Medicine Literature Review (GEMLR) began 7 years ago as an effort to distill the best of the international EM literature into a format that was easy for both academics and practitioners to digest. The review was initially started by a group of residents who were part of the Emergency Medicine Residents' Association International Committee, but has since grown into an independent editorial board that includes physician researchers from around the globe who practice EM in a number of underserved settings. In the past, the review has been called the International Emergency Medicine Literature Review. This past summer the decision was made to change our name to the GEMLR. The term *global* is more inclusive as it encompasses research conducted in one or more nations by academics from another nation, as well as research conducted within a single nation by investigators from that nation.

The primary goals of the review are to illustrate best practices, stimulate research, and promote further professionalization in the field of global EM. Each year, the number of high-quality articles in the field grows significantly, and thus the mission of the review becomes more challenging. The scope of global EM continues to stretch beyond its earlier boundaries to include injury prevention, epidemiologic transition, and device implementation. For our 2011 review, though, we continued to include research falling into one of the following categories: disaster and humanitarian response, emergency care in resource-limited settings, or EM development. Disaster and humanitarian response includes research on the care of civilian populations in conflict; disaster mitigation, assessment, and response; and health care of refugees and internally displaced persons. Emergency care in resource-limited settings includes trauma care, acute medical care, triage, and prehospital care in low- and middle-income countries or resource-limited settings of high-income countries. EM development includes research on the development of EM as a specialty, EM educational programs, or emergency medical care systems outside of North America, regardless of the national income level.

Based on analysis of our scoring data from previous reviews, we made significant changes to our scoring criteria this year. In particular, we eliminated scoring categories that tended to have poor interrater reliability, while further refining our scoring questions based on feedback from our reviewers. This is also the second year that we tackled the large body of grey literature as a part of our review. Grey literature has been defined as any material not produced by an organization whose primary function is publication.[1] Our goals in conducting this grey literature search were to identify new global EM research conducted by government agencies, local or international nongovernment organizations, or other entities that may not have been published in an indexed journal. While our grey literature search produced several additional global EM research articles for review not identified by our Medline search, none of the articles found was of sufficient quality to be included for full review this year.

METHODS

Each year, the editorial board for the GEMLR group produces a procedure manual that outlines in detail the methodology for its search, screening, scoring, and reviewing processes. As a review article, no prior ethical or institutional review board approval was sought for this article. None of the authors or reviewers reported any conflict of interest. As reviewers and editors could not be blinded to the authors of the articles included in the review or their affiliations, in all cases both reviewers and editors were recused from scoring or reviewing any articles in which they may have been directly or indirectly involved.

The initial search was conducted in two blocks: the first from January 1 to August 31, 2011, and the second from September 1 to December 31, 2011. We used PubMed to search Medline for original research or review articles that contained at least one ''global'' search term and one ''emergency medicine'' search term. The EM search terms included: *emergency medicine, refugees, emergency treatment, relief work, rescue work, acute disease, humanitarian, critical illness, war, pre-hospital, conflict, triage, disasters, multiple trauma, injuries, internally displaced persons, emergencies,* and *emergency medical services*. The international search terms included: *world health, developing countries, international, global, tropical medicine, third world, middle income countries,* and *low income countries*. A ''hand search'' of journals that published significant numbers of articles that were included in our prior reviews was also performed. This year, the following journals were included in the hand search: *Academic Emergency Medicine, Annals of Emergency Medicine, Bulletin of the World Health Organization, Emergency Medicine Journal,* and *Prehospital and Disaster Medicine*.

Based on the linguistic capacity of our reviewers and editors, our search this year was limited to articles published in English, French, German, Spanish, Portuguese, Italian, and Chinese. All studies were limited to human subjects only; news articles and letters were excluded.

The total number of articles produced by our PubMed search for 2011 was 6,581: 4,566 English, 589 German, 541 French, 469 Spanish, 245 Chinese, 109 Italian, and 62 Portuguese language articles. The total number of articles produced by our hand search for 2011 was 1,343. The 7,924 articles produced by these two searches were divided up among 20 reviewers for initial screening based on their relevance to the field of global EM (as defined by the criteria listed above). A total of 199 articles were deemed appropriate by at least one reviewer and approved by their editor for formal scoring of their overall quality and importance.

This year was the second year that we conducted a grey literature search, although we revised our search

methods significantly this year. Based on the recommendations of our editorial board, we created a list of academic, government, and nongovernment organizations known to be conducting global health research or investigations as part of their work (Table 1). We then assigned two reviewers to systematically search the websites of these organizations for needs assessments, program monitoring and evaluation reports, topic reviews, white papers, conference proceedings, or other types of articles that met our predefined screening criteria for relevance to the field of global EM. We found seven additional global EM research articles through this grey literature search process that met our inclusion criteria. These were combined with those identified by the Medline search to create a database of 206 research articles for formal scoring.

Once selected for scoring, the full-text article was obtained and categorized as either an original research or a review article. Each article was then scored by two separate reviewers using a grading scale that ranged from 0 to 20 (Table 2), with the average of the two scores used as the final score for the article. All articles with a score difference that was greater than 5 points (two standard deviations above the median score difference) were rescored by an editor. The new score was then used as the final score for the article. Overall, 24 articles had final scores of 17 or greater and were selected for formal review. These articles were then distributed to reviewers who produced summaries and critiques of each article.

RESULTS

Of the 206 articles that met our predetermined inclusion criteria, 57% were categorized as emergency care in resource-limited settings, 29% as EM development, and 14% as disaster and humanitarian response. About 42% of the articles were considered original research, while the remaining 58% were review articles.

The median final score for all articles was 13, ranging from 5 to 19.5. The difference in mean scores between Medline (12.99) and Grey Literature (12.14) articles did not reach statistical significance ($p = 0.14$). Similarly, the difference in mean scores between original research (13.16) and review (12.86) articles did not reach statistical significance ($p = 0.43$). The difference in mean scores between emergency care in resource-limited settings (13.50), EM development (12.49), and disaster and humanitarian response (11.68) articles, however, was statistically significant ($p < 0.005$). Interrater reliability for reviewer scoring, measured using the interclass correlation coefficient, was 0.63 (95% confidence interval = 0.51 to 0.72), considered ''good'' reliability in the literature.

The top 24 global EM articles for 2011 are listed in Table 3.[2–25] The complete database of all 206 global EM articles for 2011, as well as full summaries and critical analyses of the top 24 global EM of articles of 2011, can be found online as Data Supplements S1 and S2 (available as supporting information in the online version of this paper).

Table 1
Grey Literature Sources

Academic centers/think tanks
1. Global Health Council
2. Center for Global Development
3. The United Nations University
4. RAND Corporation
5. The Woodrow Wilson Center
6. The Bill and Melinda Gates Foundation
7. Center for Global Health Research/University of Toronto
8. Emergency Trauma Care Project

NGOs, UN, and government agency websites
1. MEASURE Evaluation
2. MSF
3. Epicentre
4. International Rescue Committee
5. International Medical Corps
6. Oxfam International
7. Oxfam Great Britain
8. GIZ/GTZ
9. International Committee of the Red Cross
10. Center for Disease Control
11. World Health Organization
12. Humanitarian Practice Network
13. UN High Commission for Refugees
14. UN Development Program
15. Inter-Agency Standing Committee
16. UNICEF
17. JHPIEGO

DISCUSSION

When compared to previous reviews, this year's review yielded significantly more manuscripts that were devoted to emergency care in resource-limited settings, with fewer articles related to disaster and humanitarian response. In fact, no articles categorized as disaster and humanitarian response scored 17 or above, our cutoff this year for full review. Below we summarize some of the trends in global EM research in 2011.

Emergency Care in Resource-limited Settings

The percentage of articles related to EM practice in resource-limited settings has continued to grow, accounting for 80% of the articles that were selected for full review this year. As in previous years, many of the articles selected focus on vulnerable populations, such as women and children. Opiyo and English[19] reviewed the clinical signs that are indicators of severe illness in neonates in developing countries, while Zhang et al.[25] studied the accuracy of clinical signs for hypoxemia in children with respiratory infections. The eight clinical signs that predict severity of illness in infants under 60 days are history of feeding difficulty, history of convulsions, axillary temperature greater than or equal to 37.5°C or less than 35.5°C, change in level of activity, fast breathing/respiratory rate greater than or equal to 60 breaths/min, severe chest indrawing, grunting, and cyanosis. By adding fever to the World Health Organization (WHO) criteria for pneumonia, Cardoso et al.[15] were able to enhance the ability to identify pneumonia cases among wheezing children. Nonpharmacologic management of procedural pain in infants and children was reviewed by Pillai Riddell et al.[12] and was found to reduce acute pain perception.[20] Bandsma et al.[12] found that impaired glucose absorption in chil-

Table 2
Review Scoring Criteria

	Original Articles	Points	Review Articles	Points
Clarity			Clearly stated purpose for review	2
			Sufficient background provided	1
			Understandable to nonprofessional	1
			Clear language, appropriate use of tables and figures	1
Design	RCT or observational study with control group	2	Formal meta-analysis or systemic review (including studies with a control group)	2
	No bias in selection of subjects; attempts to limit bias	1	Study selection is clear and reproducible	1
	Adequate blinding of study subjects	1	Article selected by at least two blinded authors	1
	Correct statistical tests used for analysis	1	Data aggregated and/or analyzed appropriately	1
Ethics	Approved by IRB	2		
	Adheres to Declaration of Helsinki	1		
	Consent obtained or waived by IRB	1		
	Authors have no COI	1		
Importance	Results are generalizable to a variety of settings	2	Results are generalizable to a variety of settings	2
	Topic is important	1	Topic is important	1
	Topic is clearly relevant to GEM	2	Topic is relevant to the realm of GEM	2
Impact	Recommendations can be mplemented in developing countries	2	Recommendations are applicable across a wide range of different settings	2
	The proposed intervention is cost-effective	1	Intervention studied is cost-effective	1
	NGOs, UN agencies, and other actors would likely change their practice if they were aware of this study	1	NGOs, UN agencies, and other actors would likely change their practice if they were aware of this study	1
	Study results likely to stimulate further research	1	Study results likely to stimulate further research	1

COI = conflict of interest; GEM = global emergency medicine; IRB = Institutional Review Board; NGO = nongovernmental organization; RCT = randomized controlled trial; UN = United Nations.

dren with severe malnutrition correlates with oxidative stress in these children.

A number of articles chosen this year reviewed or studied treatment regimens for various acute infectious diseases. Most of them examined the efficacy of particular treatment regimens for diseases that are primarily seen in low- and middle-income countries. For example, flouroquinolones were found to be most efficacious for the treatment of typhoid and paratyphoid fever by Effa et al.,[16] whereas azithromycin was not found to be effective for the treatment of malaria by van Eijk and Terlouw.[23] In Pakistan, a cluster-randomized trial studied amoxicillin for community-based treatment of pneumonia in young children and found that community health workers deliver treatment for severe pneumonia with more success than referral to the hospital.[13] Alternative rehydration methods, including nasogastric and intraosseous rehydration, were reviewed by Rouhani et al.[21] and found to be efficacious as compared to intravenous hydration for moderate to severe dehydration in children with diarrhea. Two additional articles examined different antibiotic regimens for treatment of fever. Guerrier and Doherty[17] conducted a meta-analysis of treatment of louse-borne relapsing fever and determined that tetracycline is significantly superior to penicillin for fever clearance time and relapse rates. Arjyal et al.[10] performed a randomized control trial comparing gatifloxacin to chloramphenicol for treatment of enteric fever. The two drugs were equally efficacious; however, gatifloxacin has shorter treatment duration, fewer adverse events, and lower cost.

Prevention emerged as the theme of several articles. Alam et al.[9] compared zinc treatment for 5 versus 10 days for treatment of diarrhea in Bangladesh and found that the treatment regimens were equally efficacious. Prevention of acute mountain sickness was evaluated by the SPACE trial group, which found acetazolamide to be more efficacious than spironolactone.[14] Wilson et al.[24] performed a meta-analysis to identify and summarize the research on intermittent preventative treatment of malaria for children living in areas subject to seasonally predictable malaria. They found that researchers have had good success attempting to reproduce positive effects for children living in areas where malaria is seasonally predictable.

A final group of studies discuss typical presentations for diseases in resource-limited settings. Thomas et al.[22] discussed how Dengue presents in an adult emergency department (ED) in Martinique. They note that the presence or absence of plasma leakage remains an important factor in directing treatment for patients with Dengue fever. Kung et al.[18] analyzed a series of cases of acute myeloid community-acquired pneumonia in Taiwan. The following factors were predictive of myeloid-type pneumonia: presentation during the rainy season, poor glycemic control, and shock on arrival. Finally, Ashley et al.[11] reviewed antimicrobial susceptibility of bacterial isolates from community-acquired infections in low- and middle-income countries in Africa and Asia. Both *Klebsiella* and *Escherichia coli* show high resistance to chloramphenicol, amoxicillin, and cotrimoxazole, while susceptibility to gentamicin is only 70%.

Table 3
Top 24 Global EM Articles of 2011

Category	First Author, Reference	Title	Journal
EM development	Allegranzi[2]	Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis.	*Lancet*
	Jayaraman[3]	Disparities in injury mortality between Uganda and the United States: comparative analysis of a neglected disease.	*World Journal of Surgery*
	Legarde[4]	The impact of user fees on access to health services in low- and middle-income countries.	*Cochrane Database*
	Metcalfe[5]	Interferon-gamma release assays for active pulmonary tuberculosis diagnosis in adults in low- and middle-income countries: systematic review and meta-analysis.	*Journal of Infectious Diseases*
	Mikrogianakis[6]	Telesimulation: an innovative and effective tool for teaching novel intraosseous insertion techniques in developing countries.	*Academic Emergency Medicine*
	Nyamtema[7]	Maternal health interventions in resource limited countries: a systematic review of packages, impacts and factors for change.	*BMC Pregnancy and Childbirth*
	Thompson[8]	Validation of a Simplified Motor Score in the Out of Hospital Setting for Prediction of Outcomes in TBI.	*Annals of Emergency Medicine*
Emergency care in resources-limited settings	Alam[8]	Zinc treatment for 5 or 10 days is equally efficacious in preventing diarrhea in the subsequent 3 months among Bangladeshi children.	*Journal of Nutrition*
	Arjyal[10]	Gatifloxacin versus chloramphenicol for uncomplicated enteric fever: an open-label, randomised, controlled trial	*Lancet Infectious Diseases*
	Ashley[11]	Antimicrobial susceptibility of bacterial isolates from community acquired infections in Sub-Saharan Africa and Asian low and middle-income countries	*Tropical Medicine & International Health*
	Bandsma[12]	Impaired glucose absorption in children with severe malnutrition	*Journal of Pediatrics*
	Bari[13]	Community case management of severe pneumonia with oral amoxicillin in children aged 2–59 months in Haripur district, Pakistan: a cluster randomized trial.	*Lancet*
	Basnyat[14]	Spironolactone does not prevent acute mountain sickness: a prospective, double blinded, randomized, placebo-controlled trial by SPACE Trial Group (spironolactone and acetazolamide trial in the prevention of acute mountain sickness group)	*Wilderness and Environmental Medicine*
	Cardoso[15]	Adding fever to WHO criteria for diagnosing pneumonia enhances the ability to identify pneumonia case among wheezing children.	*Archives of Disease in Childhood*
	Guerrier[16]	Comparison of antibiotic regimens for treating louse-borne relapsing fever: a meta-analysis.	*Transactions of the Royal Society of Tropical Medicine & Hygiene*
	Kung[17]	Acute myeloid CAP.	*International Journal of Infectious Diseases*
	Effa[18]	Fluoroquinolones for treating typhoid and paratyphoid fever (enteric fever).	*Cochrane Database*
	Opiyo[19]	What clinical signs best identify severe illness in young infants aged 0–59 in developing countries? A systematic review.	*Archives of Disease in Childhood*
	Pillai Riddell[20]	Non-pharmacological management of infant and young child procedural pain.	*Cochrane Database*
	Rouhani[21]	Alternative rehydration methods: a systematic review and lessons for resource-limited care.	*Pediatrics*
	Thomas[22]	Clinical presentation of Dengue among patients admitted to the adult ED of a tertiary care hospital in martinique: implications for triage, management, and reporting.	*Annals of Emergency Medicine*
	van Eijk[23]	Azithromycin for treating uncomplicated malaria.	*Cochrane Database*
	Wilson[24]	A systematic review and meta-analysis of the efficacy and safety of intermittent preventive treatment of Malaria in children (IPTc).	*PLoS One*
	Zhang[25]	Accuracy of symptoms and signs predicting hypoxaemia among young children with acute respiratory infection: a meta-analysis.	*International Journal of Tuberculosis and Lung Disease*

EM Development

As cell phones and the internet become more readily available in developing countries, EM practitioners have started to explore new ways to teach EM via distance learning. To that end, Mikrogianakis et al.[6] wrote an interesting article on the use of telesimulation to teach intraosseous insertion. The study demonstrated improved self-reported physician confidence, knowledge, and comfort level when physicians used telesimulation to teach other physicians intraosseous insertion at a remote location. A number of other articles evaluated the use of devices, laboratory studies, or interventions that have been adapted for low-income settings. For example, interferon-γ release assays for active pulmonary tuberculosis diagnosis were examined by Metcalfe et al.[5] and were found to have suboptimal test characteristics if used to diagnose tuberculosis in low- and middle-income countries. A systematic analysis of maternal health interventions in resource limited countries was performed by Nyamtema et al.[7] Based on their analysis, the most successful interventions tended to integrate multiple strategies, such as improving access to hospital care while also improving the facilities and equipment available at the hospital.

More than one author discussed the challenges that health care systems face in resource-limited settings. Lagarde and Palmer[4] examined the effect of user fees on access to health care and found that fees may lead to decreased use of health services in low- and middle-income countries, although the quality of available data on health impacts remains poor. Allegranzi et al.[2] performed a meta-analysis and found that the burden of health care associated infection in developing countries is high where it is measured; however, it is often not measured. Injury is once again highlighted in the review. An article by Jayaraman et al.[3] reported that injured patients in Kampala, Uganda, are significantly more likely to die than injured patients in the United States. An additional article by Thompson et al.[8] validated that the Simplified Motor Score was comparable to the Glasgow Coma Scale for predicting negative outcomes in patients with traumatic brain injury.

CONCLUSIONS

Global emergency medicine is a rapidly growing field. As the specialty expands, the body of work it produces continues to increase. Choosing 24 articles from the existing pool of qualified articles is an extremely difficult task. These articles were chosen to represent examples of both high-quality and high-impact emergency medicine research currently being conducted in nearly every part of the world. It is not an exhaustive list of articles, nor is it meant to be. Rather, it is a sampling of the current literature, which we hope will foster further growth in the field, highlight evidence-based practice, and encourage global discourse and further research.

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APPENDIX A

Global Emergency Medicine Literature Review (GEM-LR) Group (alphabetical):

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Supporting Information

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

Data Supplement S1. 2011 Article Database.

Data Supplement S2. 2011 Article Reviews.

The documents are in Excel and Word format.

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Call for Papers
2014 *Academic Emergency Medicine* Consensus Conference

Gender-Specific Research in Emergency Medicine:
Investigate, Understand and Translate How Gender Affects Patient Outcomes

The 2014 *Academic Emergency Medicine* (AEM) Consensus Conference, **Gender-Specific Research in Emergency Medicine** will be held on Wednesday, May 14, 2014, immediately preceding the SAEM Annual Meeting in Dallas, TX. Original papers on this topic, if accepted, will be published together with the conference proceedings in the December 2014 issue of AEM.

Gender-specific medicine is the "science of how normal human biology differs between men and women and how the manifestations, mechanisms and treatment of disease vary as a function of gender." While gender-specific medicine incorporates advances in reproductive health issues, the AEM Consensus Conference will focus on broad disease-specific EM issues that are relevant to both women and men. The key domains of the conference are cardiovascular/resuscitation, cerebrovascular, pain, trauma/injury/violence, diagnostic imaging, mental health and substance abuse.

Consensus Goal:
The goal of the 2014 AEM Consensus Conference is to stimulate EM researchers to methodically recognize, investigate and translate the impact of gender on their clinical research outcomes. The conference proposes to build a foundation upon which researchers can build interdisciplinary scholarship, networks of expertise, discussion forums, multicenter collaborations, evidence-based publications, and improved education. The overarching themes of the conference have been guided and informed by NIH research priorities on gender medicine and include study of the lifespan, sex/gender distinctions, health disparities/differences and diversity and interdisciplinary research.

Consensus Objectives:
1) Summarize and consolidate existing data and create a blueprint that furthers gender-specific research in the prevention, diagnosis and management of acute diseases.

2) Discuss the conceptual models for designing studies and analysis that incorporate gender as an independent variable.

3) Build a multinational interdisciplinary consortium to study gender medicine for acute conditions.

Accepted manuscripts will describe relevant research concepts in gender-specific areas with priority placed on differential disease risk, vulnerability, progression and outcomes. They may include work in clinical/translational, health systems, policy or basic sciences research. Descriptions of specific research, projects, or collaborations may be used for illustrative purposes but should not comprise the core of the submission. Original contributions describing relevant research or concepts on these or similar topics will be considered, and original high-quality research may also be submitted alone or in conjunction with concept papers. Papers will be considered for publication in the December 2014 issue of AEM if received by Monday, March 11, 2014. All submissions will undergo peer review and publication cannot be guaranteed.

For queries, please contact Marna Rayl Greenberg, DO, MPH (Marna.Greenberg@lvh.com) or Basmah Safdar, MD (basmah.safdar@yale.edu) the 2014 Consensus Conference co-chairs.

Information and updates will be regularly posted in AEM, the SAEM Newsletter, and the journal and SAEM websites.