Scope of Emergency Medicine Research in Low and Middle Income Countries

Prof V Anantharaman
Department of Emergency Medicine
Singapore General Hospital
Singapore
Definition of LMIC

The term refers to Low- and Middle- Income Countries. The World Bank classifies countries by income according to gross national income (GNI) per capita. For 2006, the groups were:

- Low Income  US$ 905 or less
- Lower Middle Income  US$ 906 to US$ 3,595
- Upper Middle Income  US$ 3,596 to US$ 11,115
- High Income  US$ 11,116 or more

(Ref: www.worldbank.org/data/countryclass/classgroups.html)
Objectives

Examine the variety of research programs that may be conducted in the field of Emergency Medicine in LMICs.

Examine the reasons for the lack of research programs.

Suggest approaches that may help to alleviate this issue.
Approach

Need for Research in Emergency Medicine in LMIC
Range of relevant research topics in Emergency Medicine for LMICs
Emergency Medicine Research currently being carried out in LMICs
Obstacles to development of Emergency Medicine Research in LMICs
Moving forward.
Focus

Research that is closely related to the obvious clinical, educational and administrative aspects of Emergency Medicine.

- pre-hospital emergency medical care
- disaster medicine
- injury prevention research
- care provided in Emergency Departments
- basic resuscitation research and bench research that is closely aligned to the practice of the discipline.

Emphasis on investigative methodologies to answer research questions in this field

No discussion on teaching of skills other than research skills, unless such an educational issue is being addressed as an investigative tool
Research in Emergency Medicine occurs in a wide variety of settings, e.g.

- Bench-side molecular and cellular mechanisms of basic disease processes
- Development of animal models for study of shock and sepsis, burns, and wounds
- Epidemiological research in trauma, injury prevention, cardiac arrest
- Qualitative research in disaster medicine
- Clinical outcomes studies
- Pharma-sponsored or investigator-initiated studies
- Studies on areas of Emergency Medicine administration and education.
Relevance of existing research evidence

Preponderance of EM research being carried out in “developed” world

Increasing pressure to presume that the results of these could easily be translated to clinical practice in the Emergency care environments of LMICs

Very low penetrance of apparent, evidence-based medical practice in the developing world

The results of such hugely funded clinical trials may not be totally relevant, or applicable in LMICs
Why may studies be less relevant to LMICs?

People in developed world have different vital characteristics

Dosages of drugs used in the developed world may not be formulated similarly as in the developing world:

i. human beings are smaller in size
ii. variations in genetic characteristics
iii. differences in metabolic outcomes for various medicinal products.

Various social pressures contribute to treatment regimens in developed countries. These may be less relevant in developing world.

Increasing cost of a variety of pharmaceuticals and equipment prohibits widespread use in developing world.
a) Relevance of currently available research evidence
b) Value effect to populations in LMIC

EM practitioners in LMICs need evidence base appropriate to their clinical practice

Research is resource-requiring

Lack of resources for basic medical care in many LMICs

Bulk of the available manpower and other resources needs to be focused on provision of clinical service
Service conditions in developed vs developing nations

“Clearing the crowd” in most resource-challenged communities, e.g.

- An emergency physician in Asia spends his time managing many patients.
- At the end of the work week, he is tired, exhausted and raring to go back to his family for some moments of respite and rest.
- Looking at overall clinical data of his patients, organizing them and analyzing them is the furthest thing on his mind.

Average EP in LMIC spends > 35 - 45 hr/wk in patient care activities

Average academic EP in USA spends 24 hr/wk on clinical care

- manages a smaller number of patients
- has less “clinical experience”
- Yet these are the supposed “experts” in the field

Resources and ability to organize and analyze their data, write about their work, and present these at a multitude of meetings.
Other factors inhibiting research in LMICs

Lack of dedicated research staff
Research staff cost money
Emergency Departments in LMICs not profitable business units.
Most pharma and eqpt manufacturers focus support on centers with proven track records and research infrastructure.

Training in research methods, biostats and EBM not available in LMICs
- Relatively poor research governance
- Research groups and personnel need knowledge and skills thought out by the resource-rich developed world
- Need to enforce “Good Clinical Practice” guidelines

Many young knowledgeable practitioners leave their homes in LMICs and do not return to contribute to the development of these countries.
Role of pharma

Headquarters of most pharmaceutical companies and equipment manufacturers are in the developed world. Local representatives of such pharma are often powerless. Perpetual tendency to wanting to refer to parent HQs for decisions on research programs. Local representatives exist mainly to enhance short-term sales. The lack of long-term commitment by pharma and equipment companies to LMICs.
Yet, there is hope

The bulk of disease and injury occurs, not in the “developed” world, but in LMICs.

Truly relevant lessons of clinical trials need to be conducted in such populations.

Potential funding agencies and drug / eqpt manufacturers stand to gain more in long-run if products seen as “relevant” to masses of sick and injured persons, than if they exploit misfortunes of developing world.

<table>
<thead>
<tr>
<th>Income Setting</th>
<th>Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>35 %</td>
</tr>
<tr>
<td>Middle</td>
<td>55 %</td>
</tr>
<tr>
<td>Low</td>
<td>63 %</td>
</tr>
</tbody>
</table>


Among patients surviving to reach hospital

(ISS 15 - 24) ........ 6 x ↓ mortality

Hospital in High-income country ... 6 %

Rural area Low-income country ......36 %

A: Bench-side molecular and cellular mechanisms of basic disease processes, such as is being carried out in various Resuscitation Research laboratories

i. Causes of myocardial, pulmonary and other metabolic emergencies in populations of LMICs that are contributed by different diets, lifestyles and environmental factors. Need to identify molecular mechanisms in these diseases and find new strategies for protection against them.

ii. Differences in biochemical, cellular and functional norms in populations in LMICs.

iii. Impact of newly-emerging infections rearing heads for 1st time in LMICs.

iv. Basic research rare in LMICs.

v. Many researchers from LMICs work in well-established labs in developed countries and perform state-of-art molecular and cellular resuscitation research, e.g. "Cardiac myocytes exposed to anoxia-reoxygenation promote neutrophil transendothelial migration". Tao Rui, Gediminas Cepinskas, Qingping Feng, Ye-Shih Ho, and Peter R. Kviety, Wayne State University, Detroit, Michigan.
B: Development of animal models for the study of shock and sepsis, burns, and various types of wounds

i. Very large and frequent occurrence of burns disasters, and infected wounds in developing world

ii. A gold-mine for development of animal models to study such wounds and translate lessons learnt directly to patient care.

ii. This potential to:

create availability of low-cost research personnel in LMICs to assist in study of these conditions:

(1) first in animal research labs

(2) subsequently in large hospitals often available in LMICs

has hardly been exploited by companies that manufacture and market such products.
Previous animal models used in LMIC

a) Continuous Infusion of Small-Volume Fluid Resuscitation in the treatment of Combined Uncontrolled Hemorrhagic Shock and Head Injury. Hayrettin Ozturk, Yusuf Yagmur, Askin Tas, Soykan Topcu and Murat Orak, Turkey


C: Epidemiological research in trauma, injury prevention, cardiac arrest

i. The burden of trauma is greatest in LMICs.

ii. Causes of injuries, preventive and initial treatment measures, in LMICs, may be different.

iii. High volume of trauma in LMIC creates tremendous potential for low-cost treatments and supplies required in large quantities.

iv. Factors that contribute to the high incidence of cardiovascular and cerebro-vascular disease in LMICs need to be managed for better control of outcomes. This provides potential for companies that manufacture treatments for these.

v. Cardiac arrest often not recognized as a major and pressing problem in the developing world. Programs to enable its best management need to ensure a management process suited to the local environment. Basis for this is good epidemiological research.

Yet, support and resources for such good epidemiological studies in LMICs is sorely lacking.
Examples of current research in these areas in developing countries include

a) Validation of the Ottawa Ankle Rules in Iran: A prospective survey by Shahram Yazdani, Hesam Jahandideh and Hossein Ghofrani, Education Development Center, Shaheed Beheshti University of Medical Sciences, Evin, Tabnak St., Tehran, Iran

b) Early tracheostomy in closed head injuries: experience at a tertiary center in a developing country – a prospective study: Chintamani, Jotinder Khanna, JP Singh, Pranjal Kulshreshtha, Pawan Kalra, Binita Priyambada, RS Mohil and Dinesh Bhatnagar, Department of surgery, Vardhman Mahavir Medical College, Safdarjang Hospital, New Delhi-110023, India

c) Bilateral asynchronous acute epidural hematoma: a case report: Behzad Eftekhar, Ebrahim Ketabchi, Mohammad Ghodsi and Babak Esmaeeli, Department of Neurosurgery, Sina Hospital, Tehran University, Tehran, Iran

d) Paediatric out-of-hospital resuscitation in an area with scattered population (Galicia-Spain): Pilar Blanco-Ons Fernández, Luis Sánchez-Santos, Antonio Rodríguez-Núñez, José Antonio Iglesias-Vázquez, María Cegarra-García and María Victoria Barreiro-Díaz, Spain.

e) Gastric Lavage in Acute Organophosphorus Pesticide poisoning (GLAOP) – a randomised controlled trial of multiple vs. single gastric lavage in unselected acute organophosphorus pesticide poisoning. Yi Li, XueZhong Yu, Zhong Wang, HouLi Wang, XiangHuai Zhao, YuPing Cao, WeiZhan Wang and Michael Eddleston, China.

f) Toxicity of brake oil, N Sharma and S Jain: The Department of Internal Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh, India

g) Comparison of the effectiveness of trauma services provided by secondary and tertiary hospitals in Malaysia. Dinesh Sethi MD, FFPH, Syed Aljunid PhD, MD, Sulong B. Saperi MD, Felicity Clemens MSc, Pollyanna Hardy MSc, Diana Elbourne PhD, Anthony B. Zwi PhD, FFPHM and Research Steering Committee, Malaysia

h) Strengthening care for injured persons in less developed countries: A case study of Ghana and Mexico. Charles Mock; Carlos Arreola-Risa; Robert Quansah
Funding for Emergency Research in LMIC

Recently, the Wellcome Trust has stated that it will consider funding emergency research where the ability of an individual to give consent is compromised or impracticable, provided that the research protocol receives ethics committee approval and complies with all relevant national legislation.

(Ref: Position statement on Strategic Plan 2005 – 2010)
D: Qualitative research in disaster medicine

i. 90% of disasters in the world occur in LMICs.

ii. Asia comprises 31% of the total world area but suffers 40-50% of all natural disasters. With 58% of the world’s total population it has accounted for 70% of all disaster related deaths since 1950.

iii. During last decade 90% of people reported affected by all types of disasters were Asian.

iv. Current research sponsors do not see any financial incentive for sponsoring disaster-related research, especially in those countries that are most disaster-prone.

v. Investing in research in such countries support for the projects generated by research from these governments and from those of high-income countries with potential for disaster.
Disaster Medicine research from LMICs

a) Impact of disaster-related mortality on gross domestic product in the WHO African Region by Joses M Kirigia, Luis G Sambo, William Aldisand Germano M Mwabu, University of Nairobi, Kenya (this was a WHO-funded paper)

b) Treatment of Children with Severe Compression Trauma R.A. Keshicshyan, MD, PhD; L.M. Roshal, MD; L.B. Puzhitstky, MD (Russia)

c) S A Mujeeb and S H Jaffery: Emergency blood transfusion services after the 2005 earthquake in Pakistan
# Scope of disaster medicine research


<table>
<thead>
<tr>
<th>Political / Legal / Ethical</th>
<th>Untilled or undertilled research areas, by hazard phase and analytic unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost-benefit analyses; reviewing regulatory policy instruments; vaccine development strategies; mass vaccination ethics</td>
<td></td>
</tr>
<tr>
<td>Vulnerable population registries; governance issues of shared authorities; extent and efficacy of public health police powers</td>
<td></td>
</tr>
<tr>
<td>Modified standards of care; triage and allocation standards; liability &amp; professional credentialling; cross-border access and treatment issues</td>
<td></td>
</tr>
<tr>
<td>Disaster-relief Medicaid; waiver of regulations (HIPAA, workforce rules)</td>
<td></td>
</tr>
<tr>
<td>Defining when &quot;disaster relief&quot; ends and social assistance begins</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social / population</th>
<th>Analyzing effect of social, economic, linguistic vulnerabilities on disaster outcomes</th>
<th>Developing surveillance tools and trigger points for medical and public health response</th>
<th>Unanticipated consequences of public health interventions</th>
<th>Role of social services (housing, education, community re-engagement) in limiting physical and mental health sequelae</th>
<th>Long-term recovery as a form of local system and community development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical hardening of facilities; value of normalizing ongoing collaboration among sectors</td>
<td>Workforce training and policies to assure willingness and ability to work during a disaster</td>
<td>Systems for coordinating private medical and public health activity; emergent referral networks</td>
<td>Development of shared data systems (health records, pharmacy records)</td>
<td>Maintaining stable public health functions if workforce and system have been severely disrupted</td>
<td>Estimating the long-term physical and mental health impacts of disaster</td>
</tr>
</tbody>
</table>

| Organizational |  |
|----------------|  |
| Development of tailored preventive health messages for vulnerable patients by enhancing self-sufficiency |  |
| Outcomes research on value of individual preparedness in reducing system burden |  |
| Treatment efficacy and protocol studies; matching responder capacity to need |  |
| Disaster-based primary care: defining the evolution of emergency to primary care |  |

| Individual / Clinical |  |
|-----------------------|  |
| Prevention + Mitigation | Preparedness | Response | Short-term recovery | Long-term recovery |  |
E: Clinical outcomes studies

i. still in their early infancy in Emergency Medicine.

ii. the need to hospitalize a fairly large proportion of patients coming to the Emergency Department. Conduct of outcome studies of interventions carried out in EDs difficult.

iii. greater proportion of those who present to EDs can be managed aggressively there for up to about 24 hours. There is potential here for a lot of outcome studies to be carried out in the discipline of Emergency Medicine.

iv. governments and populations that are feeling the impact of increasing health-care costs.

v. involvement of pharma and investment of significant resources in this area
Examples of Outcome Studies

a) Registry based trauma outcome: perspective of a developing country: H Zafar, R Rehmani, A J Raja, A Ali and M Ahmed (Pakistan)


F: Drug and equipment-associated pharma-sponsored studies

i. the right and careful selection and evaluation of investigators and site

ii. site and investigator selection for Good Clinical Practices (GCP) clinical trials in some developing countries such as India are in place

iii. GCP studies are now more easily done in LMICs as the quality of data is good, costs are lower and patient enrolment is much faster resulting in early completion of studies.
G: Studies on areas of Emergency Medicine administration and education

ii. Research on educational aspects of emergency medicine are abundant in the USA, but rare in the developing world.

As a result, there is often blind acceptance of educational and administrative methods used elsewhere, without considering applicability in special environments.

Some of the very few journal articles in this area that I have been able to access include:

a) The use of classroom training and simulation in the training of medical responders for airport disaster: A M Idrose, W A W Adnan, G F Villa and A H A Abdullah

b) The impacts and outcomes of implementing head injury guidelines: clinical experience in Thailand: Sanguansin Ratanalert, Thirawat Kornsilp, Nakarin Chintragoolpradub and Suwit Kongchoochouy

Lack of resources for conduct of such research

EM Academic leaders in Developing countries to initiate such studies in their own communities

Emergency Departments in LMICs also need to try out novel approaches to ED issues in their communities and report on these.
Conclusion

There is a near absence of such journals from Low and Moderate Income countries.

Many reasons why articles from LMICs do not find their way to these journals.

The low rate of publication may also be a factor that discourages research activity in these countries.

The development of research requires

- resources for outlets for the publicity that is needed for results of such research.
- create easier access for researchers from LMICs

The practice of emergency medicine should not just be based on the characteristics and responses of populations from a select group of adequately resources nations.
International Conferences on Emergency Medicine (ICEM)

1986 – Britain
1988 – Australia
1990 – Canada
1992 -- USA

• 1994 – Britain
• 1996 – Australia
• 1998 – Canada
• 2000 -- USA

• 2002 – Britain
• 2004 – Australia
• 2006 – Canada
• 2008 -- USA

• 2010 – Singapore
AREAS OF INTEREST (list not comprehensive)
1. General Emergency Medicine
2. Emergency Cardiac Care
3. Emergency Trauma Care
4. Emergency Toxicology
5. Disaster Medicine
6. Emergency Pre-hospital Care
7. Emergency Observation Medicine
8. Paediatric Emergency Medicine
9. Emergency Geriatrics
10. Emergency Imaging
11. Administration of Emergency Care
12. IT in Emergency Care
13. Critically Appraised Topics (CATs) / Best Evidenced Topics (BETs) / Evidence Based Medicine / Knowledge Translation (KT)
14. Medico-Legal and Ethical Perspectives in Emergency Medicine
15. Emergency Airway Management
16. Emergency Medicine Education
17. Resuscitation
18. International Emergency Medicine
19. Miscellaneous topics in Emergency Medicine
What goes into each track?

plenary speeches
state-of-the-art presentations on key topics
moderated, themed free papers sessions / themed poster sessions
expert panel discussion on special topics to be determined by the network
workshops: planned, structured, interactive and facilitated
symposia on identified special areas
Networking - so that
Emergency Medicine - the world moves forward
THANK YOU

We look forward to taking care of you in Singapore, 9th – 12th June 2010
Thank You