A Systematic Review of Humanitarian Logistics Models for Medical and Healthcare Products in Humanitarian Emergencies in Africa

HI² Research Seed Grants

Richard Oloruntoba Ph.D. (Principal Investigator)
Newcastle Business School,
The University of Newcastle,
1 University Drive, Callaghan, NSW 2324
Australia
Email: Richard.Oloruntoba@newcastle.edu.au
Ph.: +61 2 49217114, Mobile: +61 400291245
Fax: +61 2 49216911

Seye Babatunde MBBS, MPH, FWACP,
Centre for Health and Development
Department of Community Medicine, University of Port Harcourt Teaching Hospital,
Port Harcourt, Nigeria
Ph.: +234 (0) 803-310 4723, 809-810 4723
Emails: seyebabs@gmail.com
ob.babatunde@uniport.edu.ng

Kingsley Agho Ph.D.
School of Science and Health,
The University of Western Sydney
New South Wales
Australia 2571
Office Ph.: + (02) 46203635; Office Fax: (02) 46203792; Home Phone: (02) 49342862
E-mail: k.agho@westernsydney.edu.au

Summary of Proposed Research

Introduction

This is a two part project. The first part: (1) reviews and classifies the range of published humanitarian logistics models for sourcing, delivery and distribution of medical and healthcare products for humanitarian emergencies in Africa from 1990 to 2015; (2) assess and identify effective models based on logistics performance criteria; and (3) develop an optimal high performance model for sourcing, delivery and distribution of medical and healthcare products for humanitarian emergencies in Africa and other developing regions.

Methods

Several databases will be searched for empirical studies evaluating and reporting on logistics models for sourcing, delivery and distribution of medical and healthcare products for humanitarian emergencies in Africa from 1990 to 2015 in clinical and field contexts. Under the close supervision of the Principal Investigator Dr Richard Oloruntoba and the Third Investigator Dr Kingsley Agho, standardised systematic review methods will be used by three independent reviewers (Research Assistants) independently assessing eligibility of published works, extracting data and evaluating study quality, and an evidence-based narrative summary will be produced. The narrative summary of each model will be assessed and ranked based on logistics performance criteria.

Practice implications

In the absence of explicitly codified knowledge of high performing and effective logistics models in the humanitarian and health logistics literature and within the community of logisticians, a comprehensive classification and typology of available logistics models and their effectiveness in various contexts is a practical instrument for logisticians, public procurement managers, public health managers, disaster managers and humanitarian practitioners to quickly assess and select an optimal model that best fits a clinical or field setting.

Proposed Research Protocol

Rationale

Humanitarian logistics is emerging as a priority to enhance and maintain health and wellbeing of populations in emergencies and disasters and is now well recognised as an important determinant of population health and community wellbeing (Long and Wood, 1995; Jarrett, 1998; Thomas, 2003; Kovacs and Spens, 2007). However there is no universally agreed optimal humanitarian logistics model, measures of performance, or measurement tool to assess the effectiveness of existing humanitarian logistics models for medical and healthcare products in the context of humanitarian emergencies in Africa and other developing regions. This is not surprising given that humanitarian logistics is a broad term for a mixed array of operations such as disaster and emergency relief including international medical and food assistance as well as continuous developmental assistance for developing regions (Kovacs and Spens, 2009).

Delivering and distributing emergency and longer term humanitarian assistance including medical and health care products has important consequences for the world's pharmaceutical, agricultural, transportation, and logistics industries. In fact, it has been reported that logistics efforts account for as high as 80 percent of the costs of all humanitarian assistance (Trunick, 2005). The speed and sustainability of humanitarian aid in an emergency or after a disaster depends on the ability of logisticians to procure, transport, receive and rapidly distribute supplies at the site of a humanitarian relief effort (Thomas, 2003; Thomas and Kopczak 2005). However, humanitarian and disaster relief operations including delivery of medical and health care products are often undertaken in developing countries, an environment often with sub-standard infrastructure (Cassidy, 2003; Long and Wood, 1995) ranging from a lack of electricity to limited logistics and transport infrastructure. Other documented challenges within logistics literature on Africa include institutional voids in which African institutions and regulatory bodies are often considered weak and unpredictable as well as relatively significant human and financial resource constraints (Fawcett and Waller, 2015). Hence, much scholarly and practical effort has been put into building capabilities and capacities through the promotion of managerial capacity, positive employee behavior, and ethical values as well as adopting governance modes and logistics organizational designs for operating in less formal and less structured operating environments.

While there are some similarities in humanitarian contexts in developing regions, there are often differences that are situation specific. Nonetheless, the challenges in matching timely supply with demand in an efficient manner in the context of sourcing, delivery and distribution of medical and healthcare products for humanitarian emergencies in developing regions is a much discussed topic with no easy solution. Unpredictability of demand, unstable market conditions, goods in-kind donations, and donor funding issues challenge how effectively a logistics system can operate in these types of scenarios, more so when temperature controlled storage or transport is required for medical and healthcare products.

Another challenge is the numerous definitions of the concept of humanitarian logistics, and how best to measure their performance given their peculiarities and differences from everyday commercial retail logistics. Also, there are many generic logistics models published including humanitarian, health, and medical related models but there is little existing

evidence of the extent to which these models capture all relevant aspects of good performance when assessed on routine performance criteria as well as humanitarian performance criteria (e.g. Meade and Sarkis, 2002;Thai, 2013 L'Hermitte, Tatham and Bowles, 2013). This myriad of logistics models makes it difficult to determine optimal and appropriate logistics models to deploy when humanitarians execute health and medical relief in developing regions.

The complexity and breadth of elements constituting humanitarian logistics and the rapidly developing nature of research in this area have contributed to the range of definitions of humanitarian logistics, and concomitantly has resulted in the development of a range of humanitarian logistics models that conceptualize or measure differing elements of humanitarian logistics using varying techniques. We however adopt the definition by Thomas and Mizushima (2005, p. 60): Humanitarian logistics as "the process of planning, implementing and controlling the efficient, cost-effective flow and storage of goods and materials, as well as related information, from point of origin to point of consumption for the purpose of meeting the end beneficiary's requirements". Except for its focus on the end beneficiary, this definition is largely comparable to any definition of business logistics. Features of humanitarian logistics often include: limited resources in terms of supply of materials, people, technology, transportation capacity, and money; high stakes associated with the timeliness of deliveries due to potential loss of life and associated human suffering; difficulty in predicting demand as regards timing, location, type, and size; and in sudden on-set disasters such as earthquakes suddenness of demand spikes with short lead times for sourcing, transportation, delivery and distribution of a wide variety of supplies often over long distances and international borders.

Effective logistics models for the delivery of medical and health care goods to developing regions are not often explicitly discussed as part of clinical and humanitarian practice. If this is to change (a) it is important to review the relevant scholarly literature in a comprehensive and transparent fashion, and classify the range of published logistics models for sourcing, delivery and distribution of medical and healthcare products for humanitarian work in Africa (b) assess and identify effective models based on logistics performance criteria and (c) develop an optimal, flexible, and adaptable high performance logistics model for sourcing, delivery and distribution of medical and healthcare products for humanitarian emergencies in Africa and other developing regions. This will enhance the visibility and appreciation of logistics as a valuable discipline in the delivery of medical goods and services to vulnerable populations, thus enhancing the ability of medical practitioners to fulfil the Hippocratic Oath and the Declaration of Geneva.

This proposed project will be useful to logisticians, buyers, donors, humanitarians and a range of relief workers and clinicians in charge of delivery of medical and health goods and services in the context of emergency humanitarian aid in developing regions. In the absence of any synthesis of the evidence for these different models, the extent to which they each fulfil the requirements for healthcare and public health in humanitarian situations and environments of many African communities is unknown. Selecting the most appropriate instrument is therefore a challenge for both researchers and practitioners.

Objectives

The study's goal is to enhance overall logistics service quality in the delivery of health and medical care in emergency humanitarian contexts in Africa and other developing regions. Towards this goal, the study:

1. Reviews and classifies the range of published logistics models for sourcing, delivery and distribution of medical and healthcare products for humanitarian emergencies in Africa from 1990 to 2015;

2. Assesses and identifies effective models based on logistics performance criteria; and

3. Develops a flexible, adaptable high performance model for sourcing, delivery and distribution of medical and healthcare products for humanitarian emergencies in Africa and other developing regions.

Study design and method

A systematic review of the literature will be conducted according to the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA guidelines) (Moher et al 2009), and the Cochrane collaboration (2008)'s tool for assessing and reducing the risk of bias. Standard systematic review techniques and methods will be utilised and the study protocol will be registered in a suitable management register or with PROSPERO if eligible.

Search strategy

The study will use appropriate terms, keywords, and subject headings truncations (*) as well as wild cards ($), hyphens, and other relevant Boolean operators where permitted by databases. An initially broad scoping search will be undertaken and a search strategy representing the core concepts of humanitarian logistics models will be developed following initial scoping searches. Possible (not truncated) search terms include: 'humanitarian logistics models,' 'humanitarian logistics frameworks,' 'humanitarian sourcing models,' 'emergency delivery models,' 'humanitarian distribution models,' 'logistics models of distribution,' 'humanitarian medical products,' 'emergency healthcare products,' 'medical disaster relief,' 'humanitarian emergencies,' 'Africa,' 'African health supply chains,' 'African medical supply chains.'

Studies published from January 1990 up to December 2015 will be systematically searched. The search strategy will be applied to the following business / management databases: ProQuest; Business Source Complete; Ebscohost; ABI/Inform complete – Thesaurus, Thomson Reuters; Emerald plus/Econ Lit with full text; Newcat; and West Law International (West Law next).

To be comprehensive and systematic, supplementary searches will be applied to: specialist bibliographies (e.g. Company media); google; and google scholar. Others will include hand searching of relevant websites, seminars, workshops, working papers, conference proceedings, pdf reports, and discussion papers. We intend to search grey literature and practitioner publications and websites (e.g. World Health Organisation, Medecin San Frontiere (MSF), United Nations, World Bank, consultancy publications, logistics trade journals. Lastly, the study will search the National electronic Library for Medicines (NeLM) and the Cochrane Database of Systematic Reviews (CDSR). The bibliography of included studies identified by the search will be reviewed to identify additional references to be searched and cross-referenced as are the reference sections of any review papers. The search is restricted to publications in English.

Study selection, Data extraction and Synthesis

Studies to be included in this systematic review are those that are empirical and conceptual in nature. They must also be in English, be peer reviewed, and must address humanitarian logistics models. The study must meet validity criteria on comparing it with an existing validated model of humanitarian logistics, or if it meets other forms of validity, or acceptability.

The study will exclude opinion pieces, reviews, editorials, letters, books, non-peer-reviewed reports, theses, letter to the editors as well as articles published in languages other than English.

Data extraction will follow a three step process filtering first by: title; followed by the abstract; and lastly the full text will be obtained and reviewed. All the articles will be screened by title and abstract by three independent reviewers (KP, MG and PJ). Data extraction will be undertaken using a form first pilot tested using nine randomly selected papers.

For pilot testing the abstraction process, nine randomly selected abstracts will be reviewed by each of the three reviewers and the results compared to ensure that a consistent approach is taken in evaluation of the selection criteria. The abstract and afterwards the full paper will be assessed individually. Where there is discrepancy, consensus will be negotiated, and where necessary, referral to a fourth independent reviewer (RO).

Extracted data will include study details e.g. country of origin where the humanitarian model was derived, the humanitarian context of the logistics model, year of publication, and study design. The results will be compared between the three independent reviewers to ensure that a consistent approach is taken to evaluating the literature based on selection criteria. In cases of discrepancy, consensus will be negotiated through discussion and where necessary, referral to a fourth independent reviewer (RO).

Quality assessment

The quality assessment process will be undertaken independently by three reviewers, and consensus on the final quality classification reached through negotiation and discussion.

Three approaches will be used to assess the quality of the review (1) risk of bias, (2) robustness of suggested humanitarian logistics models for healthcare and medical products in a humanitarian context, and (3) the practical suitability of suggested humanitarian logistics models.

The risk of bias will be evaluated using the A quality assessment of all included studies using the Cochrane risk of bias tool (Higgins et al 2011), and three domains relevant to the studies will be evaluated: selection; attrition and reporting. For each study reviewed, the risk of bias in each of the three domains will be classified as low, uncertain or high, as recommended in the guidelines (Higgins et al 2011). The quality assessment process will be undertaken independently by three reviewers, with consensus on the final risk classifications reached through negotiations and discussion.

Two criteria will be used to define the suitability of humanitarian logistics models for sourcing, delivery and distribution of medical and healthcare products for humanitarian emergencies:

1. Feasibility and suitability of the model for use within humanitarian emergencies from the participant and healthcare professional perspective. Dr Seye Babatunde has 25 years 'hands on' practical clinical practice in Nigeria in routine public health and medical contexts as well as humanitarian contexts. Dr Babatunde will hold discussions with his colleagues and other practitioners in Nigeria to shed more light on this as well as with the research team.

2. Suggested models be appropriate to the level of infrastructural and technological development in Africa, must not solely rely on self-assessment, and must be flexible and adaptable for variations in context.

Data analysis & reporting

A narrative analysis will be undertaken as a statistical aggregation will not be suitable given the variation and diversity in the studies/models reviewed.

Collaborators

Dr Richard Oloruntoba is the Principal Investigator and lead applicant. He is currently a Senior Lecturer in Logistics and Supply Chain Management at the University of Newcastle in Australia. He leads the research team. Richard has significant academic and practical expertise in logistics and supply chain management research. His key research area is humanitarian logistics and logistics for disaster response (please see resume).Richard's leadership and coordinating skills is key to the success of this project.

Dr Seye Babatunde is a Senior Physician and Public Health Expert at the University of Port Harcourt Teaching Hospital, a large, tertiary medical institution. Seye has vast practical medical and healthcare experience in Nigeria (Africa). He has successfully undertaken a range of collaborative medical and health practice and research with an exhaustive range of individuals, corporations, and institutions such as the World Bank, the John D. & Catherine

T. MacArthur Foundation, Shell Oil Nigeria, Ford Foundation, Canada Institute of Health Research and the Fullbright Commission. In this collaborative research team, Seye is the authority on the African context of medicine and public health goods and service delivery. He also has a pool of colleagues in Nigeria he can draw upon as regards what model is logistically required to support medical and healthcare delivery in an African setting. Seye brings his African expertise to bear on this project (please see his resume).

Dr Kingsley Agho is a Senior Lecturer in Epidemiology, Health Promotion, Research Methods and Biostatistics at the University of Western Sydney, Australia. Kingsley is the expert on the systematic literature review methodology. His close input into the supervision of how our research assistants (independent reviewers) implement the research protocol is pivotal successful project completion. Kingsley also brings expertise in public health and medical research in Asian and East African developing countries to this research. The recipient of several significant grants Kingsley's methodological skills is highly valued (Please see his resume). Overall, our skills and expertise compliment each other and is sufficient for successful completion of the proposed project.

Expected outcomes & deliverables

1. The study delivers detailed knowledge of useful logistics models for medical and healthcare products in humanitarian settings in Africa.

2. The study delivers a classification/typology of available models.

3. The study develops a model that is flexible and adaptable, and useful for the community of humanitarians, logisticians, public procurement managers, public health managers, disaster managers, relief workers, and humanitarian practitioners. Such a model can quickly be selected, adapted if necessary, and used for any sourcing, delivery or distribution of medical and healthcare goods for a clinical or field setting in a humanitarian situation in Africa and other developing regions.

4. Dissemination through an interim and final report to HI2 (discussed below).

5. A refereed conference presentation at a suitable conference

6. A manuscript submitted to a logistics or other appropriate journal

(a)Interim progress report

The research team will submit an interim/progress report to HI2 at the mid-way point of the research timeline on July 31, 2017. This report will detail the outcomes of the systematic review process undertaken and a summary classification schema of the range of published logistics models for sourcing, delivery and distribution of medical and healthcare products for humanitarian emergencies in Africa from 1990 to 2015. The interim report will also provide an update on project administration, finances and research activities undertaken thus far, and compare achievement with the planned goals.

(b)Final report

The research team will also submit a final project report on 29th December, 2017. This report will detail the proposed / developed logistics model that is flexible, adaptable, and high performing for sourcing, delivery and distribution of medical and healthcare products for humanitarian emergencies in Africa. The final report will also summarize the project and the key findings. It will detail innovations and lessons learnt, and make recommendations for future application by practitioners and research users.

(c)Dissemination

Beyond submitting a manuscript for academic journal publication and presenting at an academic conference, the research team will use other existing channels in Nigeria to disseminate the developed logistics model to stakeholders in order to advocate for change and to facilitate practical adoption and usage. Stakeholders and target groups such as donors, media, program managers, health professionals, public store officials, and public health bureaucrats in Nigeria will be identified and targeted with appropriate communication tools e.g. the training and development kits used by procurement officials in Ministries of Health. The research team will also target the regional health-related media, periodicals, and publications as well as regional health-related scientific meetings. The research team will also identify and target humanitarian, disaster management, public procurement, and public health/epidemiology policy makers in Nigeria. Non-technical policy report, policy briefs and summary powerpoint slides that summarize findings will also be distributed through the University of Port Harcourt, University of Newcastle and University of Western Sydney University web-sites with links to sites in Nigeria and regional stakeholders e.g. UNICEF, WHO, DFID, ODI, USAID, and other relevant stakeholders in Nigeria.

Ethical considerations

A systematic review of the literature is the scientific approach to synthesising a plethora of information, by comprehensively and exhaustively searching out and objectively analysing previous studies on a given issue. The issue of ethics in systematic reviews is rarely discussed as it is often erroneously assumed that published documents reviewed and analysed already met requisite ethical benchmarks (Vergnes et al 2010). While this is not a traditional medical study that require human respondents, in order to meet all ethical requirements, the researchers will:

1. Submit the protocols for this systematic review to the University of Newcastle and University of Port Harcourt Ethics Committees. Both committees will independently assess latent ethical aspects of the research protocols to be implemented in Australia and Nigeria.

2. Ensure methodological quality, rigour and trustworthiness based on the methodological steps explained based on the guidelines set by the Cochrane Foundation (2008), (Moher et al 2009) and Higgins et al (2011)

3. Avoid publication bias by excluding studies that have never been published as the risk of including studies that do not respect ethical principles may be higher among unpublished articles and articles that did not go through the peer review process.

4. Remove the element of subjectivity in the process of selecting studies and interpreting and synthesising the results. Hence, this process will be delegated to 3 qualified and experienced independent reviewers (or research assistants) who will work separately and independent of each other under the close supervision of the Principal Investigator and the two other collaborators to avoid subjectivity. Dr Kingsley Agho is experienced in undertaking and supervising a systematic review and has published such reviews. Thus our study design and methods and the qualifications and experience of the investigators underpin the ethical integrity of the study.

5. Explicitly mention potential conflicts of interest and how this systematic review was funded following Cochrane collaboration.

Timeline

- This project will be completed within **12 months** of receiving funding

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